NUCLEAR SCIENCE ABSTRACTS

Volume 11 August 31, 1957 No. 16

GENERAL

ATOMIC POWER

8759
WORK CONFERENCE ON NUCLEAR ENERGY, ST. PETERSBURG, FLORIDA, AUGUST 1-4, 1956. VOLUME I AND II. Atlanta, Southern Regional Education Board. 327p.

The results of a study on the feasibility of united action in the development of industrial opportunities in the South through nuclear energy are given. General discussions are included on the history of the project, agriculture, atomic power, general industrial applications, manpower and education, and medicine and public health. A detailed evaluation is given of the nuclear study facilities of southern schools and the relative numbers of graduates in science in the South compared to the U. S. as a whole. (M.H.R.)

RESEARCH PROGRAMS

8760 AERE-Inf/Bib-96(Suppl. 1)
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
A LIST OF REPORTS FOR SALE AND PUBLISHED PAPERS BY A.E.R.E. STAFF. (Published mainly between August 1954 and December 1955). L. J. Anthony and P. M. Harris. Sept. 1956. 41p.

BIOLOGY AND MEDICINE

8761
RECENT ADVANCES IN PLANT PHYSIOLOGY IN THE U.S.S.R. A. L. Kursanov. pp. 401-36 in (Annual Review of Plant Physiology. Volume 7. Lawrence R. Blinks, Leonard Machlis, and John G. Torrey, eds. Palo Alto, Annual Reviews, Inc., 1956. 463p.).

A review is given of plant physiology research in the Soviet Union and the important results which have been obtained during the last few years. 400 references. (R.V.J.)

RADIATION EFFECTS

8762 BNL-2827
Brookhaven National Lab., Upton, N. Y.
RADIATION MUTATIONS IN PLANT BREEDING. H. J. Curtis. [1956]. 16p. $3.30(ph OTS); $2.40(mf OTS).

Applications of radiation induced mutations in practical plant breeding programs, the special facilities available for the research, and problems and recent findings in plant mutation research are discussed. (R.V.J.)

8763 NYO-4478
Atomic Bomb Casualty Commission Hiroshima.
SUMMARY OF MEDICAL STUDIES ON HIROSHIMA CHILDREN EXPOSED TO THE ATOMIC BOMB, 1951–1953. Wataru W. Sutow. 99p.

Data accumulated over a three year period, 1950 to 1953, are presented on the physical condition of a group of children exposed to the atomic bomb at Hiroshima and a group of children selected as controls. Statistical comparisons are made of findings on the two groups. (C.H.)

8764 ORO-T-357
Johns Hopkins Univ., Chevy Chase, Md. Operations Research Office.
BIOLOGICAL EFFECTS OF WHOLE-BODY GAMMA RADIATION ON HUMAN BEINGS. Harold O. Davidson, Jr. Dec. 1956. 104p.

The short-term effects on humans of chronic whole-body exposure to γ radiations are estimated. Results are organized in a form suitable for fall-out defense planning. (R.V.J.)

8765 UR-492
Rochester, N. Y. Univ. Atomic Energy Project.
ACCELERATION OF AGING BY IONIZING RADIATION. George W. Casarett. May 22, 1957. 16p. Contract W-7401-eng-48. $0.20(OTS).

8766 USNRDL-TR-143
Naval Radiological Defense Lab., San Francisco.
EFFECTS OF IN VITRO X IRRADIATION (1000 r) ON THE DEOXYRIBONUCLEOPROTEIN COMPLEX OF SPLEEN. L. J. Cole and M. E. Ellis. Mar. 22, 1957. 22p. Project NM 006-015.

The deoxyribonucleoprotein complex was isolated from mouse spleen, x irradiated in vitro (1000 r) in the form of a dilute water solution (470 μg/ml), and then incubated at 37°C for various time intervals up to 3 hr. After 30 min incubation there was an almost 10-fold net increase in 260 mμ-absorbance in the ultracentrifugal supernatant (12,000 g for 30 min) in the irradiated, as compared with the nonirradiated, DNP. After 3 hr incubation, the differential was almost 8-fold, and at this time the absorbance value in the irradiated sample represents a conversion of approximately 50 percent of the original DNP to a form which does not sediment at 12.000 g. The ultraviolet absorption characteristics of the released material and its behavior in dilute NaCl indicate that it consists of DNP subunits. The results have been interpreted in terms of a latent radiation-induced alteration in DNP, which reveals itself on subsequent 37°C incubation as a disaggregation of the original DNP gel into non-gel macromolecular DNP subunits. (auth)

8767
FACTORS INFLUENCING DIURESIS IN RATS FOLLOWING TOTAL-BODY X-IRRADIATION. E. Irene Pentz and Robert J. Hasterlik (Univ. of Chicago, Ill.). Am. J. Physiol. 189, 11-14(1957) Apr.

8768
VOLITIONAL ACTIVITY RESPONSE OF RATS TO PARTIAL-BODY X-IRRADIATION. D. C. Jones, D. J. Kimeldorf, G. K. Osborn, T. J. Castanera, and D. O. Rubadeau (U. S. Naval Radiological Defense Lab., San Francisco, Calif.). Am. J. Physiol. 189, 15-20(1957) Apr.

8769
EFFECT OF X-RAYS ON PARTIALLY SHIELDED LENS OF THE RABBIT. Antoinette Pirie and P. Howard Flanders. Arch. Ophthalmol. (Chicago) 57, 849-54(1957) June.

8770

GENERALIZED ESSENTIAL RETICULOSIS RESULTING FROM EXPOSURE TO RADIATION. Abe Towbin, Michael Kenney, and Harry Weinrauch (Veterans Administration Hospital, New York). Cancer 10, 385-7(1957) Mar.–Apr.

8771

BIOLOGICAL EFFECTS OF K^{40} RADIOACTIVITY ON ANIMALS. A. P. Vinogradov and V. V. Koval'skiĭ (Vernadskiĭ Inst. of Geochemistry and Analitical Chemistry). Doklady Akad. Nauk S.S.S.R. 113, 315-18(1957) Mar. 11. (In Russian)

It has been found that the K^{40} radioactivity does not affect the biological and chemical reactions in the muscles of animals. (R.V.J.)

8772

EFFECT OF ANTIGONADOTROPHIC SERUM ON POST IRRADIATION CHANGES IN THE REPRODUCTIVE SYSTEM OF FEMALE MICE. Charles A. Ely (Columbia Univ., New York). Endocrinology 60, 718-28(1957) June.

8773

THE EFFECTS OF COMBINED RADIATIONS ON CROSSING OVER IN DROSOPHILA MELANOGASTER. Henry T. Yost, Jr. and Robert N. Benneyan (Amherst Coll., Mass.). Genetics 42, 147-60(1957) Mar.

Data are presented which show that infrared radiation delivered for 24 hours at 10°C is unable to modify the effect of ionizing radiations on the induction of crossing over. These data are considered in the light of other work on induced crossing over, and it is concluded that chromosome breakage is an unlikely mechanism to explain induced crossing over. The problem of induced crossing over is considered in the light of an hypothesis that the effect is upon the coiling pattern of the chromosomes. It is suggested that the use of infrared radiation may be one way to determine the correspondence between chiasmata formation and genetic crossing over. (auth)

8774

RADIATION-INDUCED PRESUMED SOMATIC MUTATIONS IN THE HOUSE MOUSE. Liane Brauch Russell and Mary H. Major (Oak Ridge National Lab., Tenn.). Genetics 42, 161-75(1957) Mar.

8775

THE INDUCTION OF CHROMOSOME ABERRATIONS IN TRADESCANTIA BY ULTRAVIOLET RADIATION. J. S. Kirby-Smith and Doris L. Craig (Oak Ridge National Lab., Tenn.). Genetics 42, 176-87(1957) Mar.

Dry pollen of Tradescantia paludosa was irradiated with monochromatic ultraviolet light of various wave lengths, and the aberrations present at the pollen tube division were studied. (auth)

8776

EFFECT OF INJECTION OF RAT BONE MARROW ON RETICULAR TISSUES OF MICE EXPOSED TO X RADIATION IN THE MIDLETHAL DOSE RANGE. C. C. Congdon, T. Marinodan, and N. Gengozian (Oak Ridge National Lab., Tenn.). J. Nat. Cancer Inst. 18, 603-13(1957) May.

8777

SOME OBSERVATIONS ON BIOLOGICAL EFFECTS OF DEUTERIUM, WITH SPECIAL REFERENCE TO EFFECTS ON NEOPLASTIC PROCESSES. Joseph J. Katz, Henry L. Crespi, Robert J. Hasterlik, John F. Thomson, and Asher J. Finkel (Argonne National Lab., Lemont, Ill. and Argonne Cancer Research Hospital, Chicago, Ill.). J. Nat. Cancer Inst. 18, 641-59(1957) May.

8778

STIMULATION OF HAIR GROWTH IN RABBITS BY IONIZING RADIATIONS. B. Jolles and S. G. Greening (General Hospital, Northampton). Nature 179, 1082(1957) May 25.

8779

THE EFFECT OF WHOLE-BODY X-IRRADIATION ON THE ENZYMATIC ACTIVITY OF SEVERAL RAT TISSUES TOWARD URIDINE, URIDYLIC ACID, CYTIDINE, AND CYTIDYLIC ACID. Kendric C. Smith and Bertram V. A. Low-Beer (Univ. of California School of Medicine, San Francisco). Radiation Research 6, 521-31(1957) May.

Rat pancreas, spleen, liver, and brain homogenates were assayed for their enzymatic activity toward uridine, uridylic acid, cytidine, and cytidylic acid, after graded doses (325 r to 1300 r) of whole-body x irradiation. Markedly differing results were obtained for spleen when the enzymatic activity was expressed as moles of substrate hydrolyzed per milligram wet weight, per milligram dry weight, or per total organ. Calculated with respect to all three parameters, the uridylic acid dephosphorylase activity increased well above the control values for pancreas and liver, but decreased in the case of spleen. The specific activities of spleen uridine phosphorylase and cytidylic acid dephosphorylase increased above that of the controls; however, the total organ activity toward uridine decreased below normal, whereas that toward cytidylic acid was unaffected. All other activities tested remained normal. The significance of these results is discussed. (auth)

8780

THE INFLUENCE OF EXPOSURE GEOMETRY ON THE PATTERN OF RADIATION DOSE DELIVERED TO LARGE ANIMAL PHANTOMS. V. P. Bond, E. P. Cronkite, C. A. Sondhaus, G. Imirie, J. S. Robertson, and D. C. Borg (Brookhaven National Lab., Upton, N. Y. and Naval Medical Research Inst., Bethesda, Md.). Radiation Research 6, 554-72(1957) May.

8781

QUANTITATIVE ASPECTS OF THE EFFECTS OF X-RAYS ON LYMPHATIC TISSUE. Peter P. H. De Bruyn and M. Marcella Tornova-Svehlik (Univ. of Chicago, Ill.). Radiation Research 6, 573-84(1957) May.

8782

ENHANCEMENT OF ACTIVITY OF NERVES BY X-RAYS. C. S. Bachofer (Univ. of Notre Dame, Ind.). Science 125, 1140-1(1957) June 7.

8783

RESULTS OF IONIZING RAYS ON THE BIOLOGICAL EFFECT OF VITAMINS OF GROUP B. Adolf Morczek and Dietrich Mücke. Strahlentherapie 102, 535-8(1957) Apr. (In German)

The effect of x rays on the vitamins thiamine, riboflavin, niacin, biotin, choline and p-aminobenzoic acid was analyzed. Vitamins in aqueous solutions, exposed to doses of from 5 to 500 kr, had a remarkable loss of efficaciousness, which was measured on test fungi in need of nutrient substance. The efficaciousness of crystalline vitamins was not changed by irradiation. (auth)

8784

INVESTIGATION OF THE EFFECT OF A INTEGRAL DOSE DISTRIBUTION ON THE LIFETIME OF WHITE MICE AFTER TOTAL-BODY IRRADIATION (1200 r). Kurt Heub and Irmgard Wolf. Strahlentherapie 102, 539-42(1957) Apr. (In German)

White mice were irradiated with a surface integral dose of 1200 r. The dose distribution within the mouse was of rotational symmetry with respect to the axis of its trunk. The qualities of radiation used were between 2.5 and 30 mm HVL of tissue. The dose distribution was calculated and measured by the radiation-induced discoloration of

plastics. There was a difference only at a very inhomogeneous dose distribution. This effect may be explained by the peripheral position of the organs sensitive to radiation. (auth)

8785

ANIMAL EXPERIMENTAL RESEARCH ON THE EFFECT OF SUBLETHAL AND SMALL RADIATION DOSES. Johannes Trautmann. Strahlentherapie 102, 543-5(1957) Apr. (In German)

Reports are given on the effects of small x ray doses on the progress of an experimentally produced general infection, on the effects of sublethal doses of total radiation on the female sex hormones of mice, and on the effects of total radiation doses of 200 r applied during the main organization phase on the fetuses. (auth)

8786

INVESTIGATION OF RADIOINDUCED TUMORS. Otto Hug. Strahlentherapie 102, 546-58(1957) Apr. (In German)

8787

CANCER FORMATION ON A RAT'S TAIL BY FRACTIONAL IRRADIATION. Ernst Stutz and Ursula Bluthgen. Strahlentherapie 102, 559-62(1957) Apr. (In German)

8788

INVESTIGATION OF THE ALKALI PHOSPHATASE LEVEL IN RAT KIDNEY AFTER LOCAL IRRADIATION. Ulrich Feine and Georg Gerber. Strahlentherapie 102, 563-8(1957) Apr. (In German)

Refer also to abstract 8861.

RADIATION HAZARDS AND PROTECTION

8789 AECU-3488

RAND Corp., Santa Monica, Calif.

WORLDWIDE EFFECTS OF ATOMIC WEAPONS. PROJECT SUNSHINE. Aug. 6, 1953. 105p. Contracts AT(11-1)-135 and AF33(038)-6413. (R-251-AEC(Amended)). $0.55.

The various aspects of long-range contamination due to the detonation of large numbers of nuclear devices are discussed. An improved methodology for assessing the human hazard is developed, and an extensive experimental program is proposed. (auth)

8790 KAPL-997

Knolls Atomic Power Lab., Schenectady, N. Y.

RADIOLOGICAL DEVELOPMENT ACTIVITIES IN THE HEALTH PHYSICS UNIT. Semiannual Progress Report [for] January–June 1953. Changed from OFFICIAL USE ONLY June 3, 1957. 33p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

The calibration of the constant air monitor used to detect Kr^{85} emanating from the Separations Process Operations was completed. An average detection efficiency of 1.1% and an absorption factor of 0.7 were determined from three series of analyses. The efficiency of Special Materials Shop air-cleaning unit in the collection of submicronic particles under specific operating conditions is reported. Recommendations to increase the efficiency are made. The collection efficiency, as a function of particles size, for air-cleaning and air-sampling filter media is reported for a face-velocity range of 0.5 to 100 cm/sec. The minimum collection efficiencies for the particle size and face-velocity ranges were investigated. The average absorptions of alpha and beta activity in the Hollingsworth and Vose-70 filter media for a series of analyses were 63 and 24%, respectively. Liquid waste studies during the period include the investigation and recommendation of a proportional sampler for combined sewer effluents and adsorption studies of fission-product activity on the Mohawk River sediment. A discussion of the metering and sampling system for the liquid waste discharged into the Mohawk River is included in this report. The adsorption of fission-product activity on Mohawk River sediment with respect to contact time, laundry detergents, dissolved solids, and the quantity of river sediment was investigated and the data are tabulated. A vegetation analysis for radioruthenium was investigated, and a tentative calculation of the maximum permissible concentrations of activity in vegetation was made. A preliminary substitute for the Sigma Pile was constructed to permit routine and low dose-rate range thermal and slow neutron calibrations. Formulas to determine the integrated dose due to the rain-out and fall-out of activity from a fission-product cloud have been developed and are discussed. (auth)

8791 KAPL-1099

Knolls Atomic Power Lab., Schenectady, N. Y.

RADIOLOGICAL DEVELOPMENT ACTIVITIES IN THE HEALTH PHYSICS UNIT. Semiannual Progress Report [for] July–December 1953. Changed from OFFICIAL USE ONLY June 3, 1957. 44p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

Results are reported from studies of the efficiency of various filter media for air cleaning and air sampling; an evaluation of air flow rate meters; a comparison of the light and the electron microscopes for studies of particle size and particle density; the chemical analysis of Ru^{106} in vegetation; the separation of K^{40} from fission products in urine and vegetation; chemical determination of microquantities of Be; adsorption of fission products on river sediment; and the performance of film badges for detecting γ doses from 0 to 800 r and quantitative and qualitative evaluation of neutron flux; and modifications in instrument designs. (C.H.)

8792 KAPL-1268

Knolls Atomic Power Lab., Schenectady, N. Y.

RADIOLOGICAL DEVELOPMENT ACTIVITIES IN THE HEALTH PHYSICS UNIT. Semiannual Progress Report [for] January–June 1954. Changed from OFFICIAL USE ONLY June 3, 1957. 25p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Results are reported from studies of the efficiencies of air-cleaning and air-sampling filter media; the efficiencies of a fast neutron scintillation detector and of film dosimeters; a comparison of film and rate meter data for determining effective energy of x radiation; design and construction of a radioactive gas counting system to measure the activity of gaseous β-emitters; the preparation and calibration of a Kr^{85} β source; design and performance of an experimental gas counting system to circulate and dilute samples of radioactive gases for calibration purposes; evaluation of radiochemical methods for the determination of Cs^{137} and of Zr^{95}; investigations of the adsorption of fission products on river sediment; and studies of methods for monitoring radioactive gases. (C.H.)

8793 KAPL-1572

Knolls Atomic Power Lab., Schenectady, N. Y.

RADIOLOGICAL DEVELOPMENT ACTIVITIES IN THE HEALTH PHYSICS UNIT. Semiannual Progress Report [for] July–December 1955. L. J. Cherubin and J. J. Fitzgerald. Changed from OFFICIAL USE ONLY June 3, 1957. 52p. Contract W-31-109-Eng-52. $0.45(OTS).

The efficiencies of milipore filters were determined for the collection of $KMNO_4$ dispersed in air in the particle size range of 0.005 to 0.2 μ. The oscillating thermal precipitator was tested to determine its efficiency for collecting duraluminum particulate material in the particle size

range of 0.1 to 2.1 μ. Basic experimental equipment prepared for atmospheric dispersion studies included a fluorescent pigment aerosol generator, fluorescence microscopy arrangement, and supplemental meteorological equipment. Routine investigations of $\beta-\gamma$ monitoring instruments were continued. Photographs of a neutron foil dosimeter are included. A technique involving acid leaching was developed for the preparation of samples for the determination of fission-product activity in soil. A rapid method is described for the preparation of samples for the determination of fission products in urine. Data are tabulated on the concentration of radioactivity in Mohawk River plankton, vegetation, and fish. Rain-out is defined as the deposition of radioactivity from the atmosphere to the earth's surface when the radioactive particles are the nuclei for the formation of the raindrops, and wash-out is defined as the quantity of radioactivity deposited on the earth by the scrubbing action of raindrops or snowflakes passing through the radioactive cloud. The integrated external dose from rain-out and wash-out was calculated. (C.H.)

8794 USNRDL-TR-139

Naval Radiological Defense Lab., San Francisco.

A FALLOUT FORECASTING TECHNIQUE WITH RESULTS OBTAINED AT THE ENIWETOK PROVING GROUND. E. A. Schuert. Apr. 3, 1957. 67p. Project NS 081-001.

A generalized fallout forecasting technique is presented with detailed computations of input parameters which were used at the Eniwetok Proving Ground. Results obtained at a recent weapons test are briefly discussed by comparison of forecast fallout with preliminary measured data. (auth)

8795

EFFECT OF BONE MARROW THERAPY ON THE VOLITIONAL ACTIVITY OF WHOLE-BODY X-IRRADIATED RATS. D. C. Jones, D. J. Kimeldorf, T. J. Castanera, D. O. Rubadeau, and G. K. Osborn (U. S. Naval Radiological Defense Lab., San Francisco, Calif.). Am. J. Physiol. 189, 21-3(1957) Apr.

8796

RELATIVE VALUE OF CYSTEAMINE AND CYSTAMINE AS RADIOPROTECTIVE AGENTS FOR FETAL AND ADULT MICE. Roberts Rugh (Columbia Univ., New York). Am. J. Physiol. 189, 31-5(1957) Apr.

8797

GLUTATHIONE PROTECTION IN X-IRRADIATED EYES. Arnold A. Swanson, Heinrich W. Rose, and Jack I. Taube (Randolph Air Force Base, Texas). Arch. Ophthalmol. (Chicago) 57, 832-9(1957) June.

Preliminary results are presented from an investigation on clinical and enzymatic changes in rabbit eyes after x irradiation alone and after x irradiation preceded by treatment with glutathione. Protection afforded by glutathione against radiation damage was significant in the retina, lens capsule, and iris. (C.H.)

8798

THE EFFECT OF CELL SUSPENSIONS UPON THE DEVELOPMENT OF CATARACTS IN IRRADIATED MICE. Frank W. Newell, Thomas C. Beaman, Leon O. Jacobson, Edna K. Marks, and Evelyn O. Caston (Univ. of Chicago, Ill.). Arch. Ophthalmol. (Chicago) 57, 846-8(1957) June.

8799

DELAYED EFFECTS IN MICE FOLLOWING ACUTE TOTAL-BODY X IRRADIATION: MODIFICATION BY EXPERIMENTAL TREATMENT. Joanne Hollcroft, Egon Lorenz, Eliza Miller, Charles C. Congdon, Robert Schweisthal, and Delta Uphoff (National Cancer Inst., Bethesda, Md., Oak Ridge National Lab., Tenn., and Argonne National Lab., Lemont, Ill.). J. Nat. Cancer Inst. 18, 615-40(1957) May.

8800

ALCOHOL AND THE BIOLOGICAL EFFECTS OF IONIZING RADIATION. N. V. Luchnik. J. Nuclear Energy 5, No. 1, 163-5(1957).

Mice were given alcohol before irradiation. Figures are given on the increased survival of mice given alcohol. It is concluded that its protective action results from an altered metabolism. (M.H.R.)

8801

BASIC HEALTH PHYSICS. I. D. E. Barnes (AWRE, Aldermaston). Nuclear Power 2, 250-3(1957) June.

This first article of a series includes general information on the four main types of ionizing radiations, the measurement units of radiation and radioactivity, the biological effects of radiation, natural exposure to radiation, and permissible doses. (M.H.R.)

8802

ENLARGING AND SUPPLEMENTING INTERNATIONAL RADIATION PROTECTION RECOMMENDATION. Robert Jaeger. Strahlentherapie 102, 582-9(1957) Apr. (In German)

8803

NOTES ON ATOMIC ENERGY FOR MEDICAL OFFICERS. New York, Philosophical Library, 1956. 187p.

Introductory information is given on physics, atomic energy, monitoring instruments, and radiation hazards and protection for use of medical personnel or anyone who may be concerned with defense against atomic bombs and similar problems. (R.V.J.)

8804

SECOND REPORT ON RADIOACTIVE PRECIPITATION. F. Alba A., T. A. Brody, H. Lezama, A. Tejera, and M. Vasquez Barete. Rev. mex. fis. 6, 97-104(1957) Apr. (In Spanish)

Data on radioactive precipitation, obtained during the period from September, 1956, to February, 1957, using the methods described in the previous report, are presented. (M.H.R.)

RADIATION SICKNESS

8805

THE EFFECT OF ORALLY ADMINISTERED FAT EMULSION ON SURVIVAL OF THE IRRADIATED RAT. Polly Vance Akin, John G. Coniglio, and Granville W. Hudson (Vanderbilt Univ. School of Medicine, Nashville, Tenn.). Radiation Research 6, 543-7(1957) May.

The possible effect of forced feeding of a fat emulsion to rats irradiated with 750 r or 1000 r Co^{60} γ-irradiation and with 800 r x irradiation was studied. No definite effects due to the emulsion were noted at the lower level of Co^{60} irradiation. With 1000 r Co^{60} and with 800 r x irradiation the rats fed fat emulsion had lower food consumption, more severe diarrhea, greater stomach distension, and shorter survival times than their irradiated controls forced-fed water. No effect on hematological values was observed due to feeding of fat emulsion. (auth)

RADIOTHERAPY

8806 NP-6318

Norsk Hydro's Inst. for Cancer Research, Oslo.

FIRST REPORT FROM NORSK HYDRO'S INSTITUTE FOR

CANCER RESEARCH FOR THE PERIOD FROM ITS OPENING IN 1954 TO JULY 1, 1956. 1956. 51p.

The buildings and facilities of the Norsk Hydro s Institute for Cancer Research are described. Cancer research activities at the Institute are discussed. In addition to routine studies a 31-Mev betatron was employed for comparative studies of high-energy and conventional x radiation on various biological test systems. Cysteamine and cystamine labeled with S^{35} were employed in investigations on the radioprotective effects of these chemicals. A list of publications from 1954 to 1956 is included. (C.H.)

8807

COMPARATIVE EVALUATION OF THE EFFECTS OF SEVERAL MODES OF THERAPY IN THE TREATMENT OF CHRONIC LEUKAEMIA. I. X-RAY THERAPY OF CHRONIC LEUKAEMIA. S. I. Sherman, D. S. Kuz'min, L. M. Rozanova, A. N. Kiseleva, N. S. Povergo, and A. D. Vakulenko. Problems of Hematology and Blood Transfusion 2, No. 1, 33-8(1957).

The clinical and laboratory data showed satisfactory response of patients to radiotherapeutic treatments of chronic leukemia. X-ray therapy with small frequently applied doses (100 r), and simultaneous transfusion of concentrated erythrocyte suspensions proved to be a safe and expedient method. (R.V.J.)

8808

COMPARATIVE STUDIES ON THE THERAPY OF CHRONIC LEUKAEMIA WITH URETHANE, EMBEKHIN, RADIOACTIVE PHOSPHORUS, AND WITH X-RAY IRRADIATION. V. I. Kostiuk and S. B. Iaes. Problems of Hematology and Blood Transfusion 2, No. 1, 39-41(1957).

8809

THE IMPORTANCE OF RADIOISOTOPE DEPARTMENT IN GENERAL HOSPITALS. Alexander Vonessen. Strahlentherapie 102, 499-505(1957) Apr. (In German)

The importance of establishing radioisotope departments above all in the ordinary hospitals where radiotherapy is carried out in all its modifications, consists in the fact that the therapy by means of radioisotopes is an essential supplement to, but not a substitute for the usual radiotherapeutic methods. Further tasks include technical education of young radiologists and medical ray-protection. (auth)

8810

INTERSTITIAL THERAPY WITH RADIOISOTOPES. Kurt Ernst Scheer. Strahlentherapie 102, 506-10(1957) Apr. (In German)

The author report on the experiences of 4 years with the endobronchial injection of radioactive gold Au^{198} in cases of bronchial carcinomas. He shows us that an Au^{198} carbon suspension should be preferred to colloidal Au^{198}. Au^{198}-seeds are implanted into the pituitary gland for the radiological hypophysectomy in advanced cases of breast cancer. (auth)

8811

METHOD OF IMPLANTING RADIOACTIVE GOLD. Werner Hellriegel. Strahlentherapie 102, 511-16(1957) Apr. (In German)

The author describes a method for implanting radioactive gold seeds in the case of tumors accessible from outside. If a suitable implantator is available it is possible to effect transcutaneous implantations in the case of brain tumors as well as transethmoidal hypophysene implantations provided the image converter is used as an auxiliary instrument. The author then fully explains the calculation of doses and the advantages of radio gold as compared with radon. (auth)

8812

MANUAL OF RADIATION THERAPY. K. Wilhelm Stenstrom. Springfield, Charles C. Thomas, 1957. 119p.

TOXICOLOGY STUDIES

8813

INTERPRETATION OF VARIABILITY OF RADON IN REPEATED BREATH SAMPLES. E. J. Martin (Univ. of Toronto, Can.). Arch. Ind. Health 15, 506-9(1957) June.

8814

A NEW CASE OF INDUSTRIAL RADIUM POISONING WITH FATAL RESULT. Hermann Muth and Alfred Schraub. Strahlentherapie 102, 575-81(1957) Apr. (In German)

A report is given on the results of physical measurings in a case (chemist) of poisoning with fatal outcome after incorporation of natural radioactive substances. The body burden of radium 226 amounted to 0.6×10^{-7} g of radiothorium to 0.3×10^{-7} Curie. This is not to be considered extremely high and keeps within the limits of the maximum permissible amount of deposit. However for the totally stored alpha-activity resulted the value 4 μC. It could be proved that this excess of alpha-activity originates from polonium-210. (auth)

TRACER APPLICATIONS

8815 ORNL-2304

Oak Ridge National Lab., Tenn.

A STUDY OF THE DISTRIBUTION AND EXCRETION OF URANIUM IN MAN. An Interim Report. S. R. Bernard and E. G. Struxness. June 18, 1957. 58p. Contract W-7405-eng-26. $0.40(OTS).

Data are presented on the tissue distribution and excretion of enriched uranium following intravenous administration to man. Data on methods of dosage determination and the effects of radiation from internally deposited U on various metabolic processes are included. (C.H.)

8816

PLACENTAL TRANSFER OF CALCIUM AND STRONTIUM IN THE RAT AND RABBIT. R. H. Wasserman, C. L. Comar, M. M. Nold, and F. W. Lengemann (Oak Ridge Inst. of Nuclear Studies, Tenn.). Am. J. Physiol. 189, 91-7 (1957) Apr.

8817

EXPERIENCE WITH RADIOACTIVE PHOSPHORUS IN TUMOR DETECTION. Edwin B. Dunphy, Joseph L. Dowling, Jr., and Alfred Scott (Harvard Medical School, Boston, Mass.). Arch. Ophthalmol. (Chicago) 57, 485-90(1957) Apr.

8818

AN ELECTRICAL ANALOGUE FOR ANALYSIS OF TRACER DISTRIBUTION KINETICS IN BIOLOGICAL SYSTEMS. J. R. Macdonald and E. G. Perry (Texas Instruments, Inc., Dallas) and L. L. Madison and D. W. Seldin (Univ. of Texas Southwestern Medical School, Dallas). Radiation Research 6, 585-601(1957) May.

An electrical analogue for the analysis of tracer distribution kinetics in compartmental biological systems is described. These systems are simulated by a network of five-decade resistors and five-decade capacitors cycled with a 1.5-second period. Voltage curves from the analogue capacitors can be compared directly with graphically plotted tracer concentration curves to high accuracy. Adjustment of analogue elements for correspondence between such voltage and concentration curves allows accurate

values of the system interconnection and of tracer volumes of distribution and flow rates to be rapidly obtained. The application of the machine to analysis of concentration curves obtained from human subjects with ascites and/or edema is described. Finally, modifications of the apparatus are discussed which make it applicable where transient flow between volumes or transfer with differing forward and back flow rates is present. (auth)

CHEMISTRY

8819 CCC-1024-TR-240
Boston. Univ.
THERMODYNAMICS OF SODIUM TETRAMETHOXYBORATE AND TETRAMETHOXYBORATE ION. L. V. Coulter and J. R. Sinclair — M. G. Haddaway, ed. May 6, 1957. 12p. For Callery Chemical Co. Contract [NOa(s)-52-1024-c].

The heat capacity of sodium tetramethoxyborate has been determined from 14 to 300°K by means of an adiabatic calorimeter. At 298.15°K the entropy was found to be 68.60 cal. deg.$^{-1}$ mole^{-1}; the heat content ($H° - H_0°$), 1037 cal. mole^{-1}; and the heat capacity, 54.70 cal. deg^{-1} mole^{-1}. The heat of solution in liquid ammonia at -33°C was found to be 0.0 kcal. ± 1 kcal. For the solution reaction of solid sodium tetramethoxyborate in liquid ammonia at -33°, $\Delta F° = 4.1$ kcal. and $\Delta S° = -17 \pm 3$ cal. deg.$^{-1}$ mole^{-1}. Relative to $S°$ [H^+(am)] = 0 in liquid ammonia at -33°C, $\bar{S}°[B(OCH_3)_4^-(am)] = 28 \pm 3$ cal. deg.$^{-1}$ mole for the tetramethoxyborate ion in the hypothetical one molal solution. (auth)

8820 ISC-777
Ames Lab., Ames, Iowa.
KINETICS OF THE REACTION BETWEEN CALCIUM AND WATER VAPOR. Charles T. Apel and Harry J. Svec. Mar. 1956. 69p. Contract W-7405-eng-82. $0.40(OTS).

Calcium metal underwent reaction with water vapor at temperatures of 20, 25, 30, 35, 40, 45, 50, 55, 60, and 70°C, and at water vapor pressures of 18, 32, 55, 72, and 93 mm. Hg. The experiments indicated that the only products were calcium hydroxide and hydrogen and that the reaction proceeded according to the equation $Ca + 2\ H_2O \rightleftharpoons Ca(OH)_2 + H_2$. A manometric study of the reaction showed that it followed the logarithmic rate law, $W = K \log(1 + 0.45t)$, where W is the weight of water in milligrams consumed per square centimeter of calcium surface, t is the time in hours, and K is a constant at a given temperature and water vapor pressure. The rate constant K was observed to be linearly dependent on water vapor pressure below 70°C, and to decrease with increasing temperature below 50°C. At 70°C, it was found to be independent of water vapor pressure. The activation energy was determined to be −7.52 kcal./mole. Temperature and water vapor pressure were related to the rate constant K in its pressure-dependent ranges and the following expression fits the data for all water vapor pressures greater than 10 mm. Hg: $K = 2.57 \times 10^{-6}(P-10)\ e^{3705°/T}$, where P is the water vapor pressure in millimeters of mercury and T is the absolute temperature. The value -10 is due to a probable limiting water vapor pressure. (auth)

8821 NP-6327
Illinois Inst. of Tech., Chicago.
INVESTIGATION OF METHODS FOR THE PREPARATION OF BORON HYDRIDES. Quarterly Technical Report for Quarter Ending June 30, 1954. Dept. of Chemistry. H. E. Gunning, A. G. Keenan, M. E. Runner, S. Sujishi, T. Hirata, and J. Keith. 33p. For Mathieson Chemical Corp. Subcontract No. M-3181-30.

8822 NP-6329
California Research Corp., Richmond, Calif.
EFFECTS OF RADIATION ON AIRCRAFT LUBRICANTS AND FUELS. Period covered: December 1, 1956 to February 28, 1957. 68p. Project title: ANPP SUPPORT. Task title: RADIATION EFFECTS. Contract AF33(616)-3184.

A C_{14-18} alkyl diphenyl ether has shown good thermal and radiation stability. A barrel-scale batch of this fluid was made with a pour point of -15°F, viscosity index of 114, and a viscosity at 210°F of 4.83 centistokes on the whole product. Exploratory synthesis emphasized diarlyalkanes of which diphenylnonane still has the most interesting physical properties. Synthetic salts are being studied for use as grease gelling agents. A grease made from a mineral oil and a terephthalamate-type gelling agent showed excellent consistency stability at 4×10^8 r. Chevron OHT Grease permitted operation of a small motor (ca 1/15 hp) in the MTR gamma source for 1058 hours at 300°F (the grease accrued about 40×10^8 r). Fluids currently being considered as lubricants include a disiloxane, diether, white oil, alkyl biphenyl, and an alkyldiphenyl ether. All data on these fluids are tabulated. The last three fluids showed good thermal stability at 600°F, as well as good hydrolytic stability at 400°F. A selenide-inhibited alkylbenzene fluid containing polymers was tested in an aircraft piston pump. Wear rates were good at 160°F and at 275°F. Inspections on irradiated (10×10^8 r) JP-4 and JP-5 fuels confirm data previously reported. Vapor loss of these fuels during irradiation in vented containers was about 10% at 10×10^8 r. An expression is presented which relates the logarithm of a function of viscosity to gamma dosage. The equation includes constants in terms of API gravity and volatility. (auth)

8823 LA-1934
Los Alamos Scientific Lab., N. Mex.
THE PREPARATION OF HIGH-PURITY THORIUM OXIDE. Robert N. Roberts. July 1955. 22p. Contract W-7405-eng-36. $0.25(OTS).

Thorium oxide prepared by the method described has the requisite quality — purity, homogeneity, and reproducibility — for use as the matrix material of spectrochemical standards. The method has been developed and tested to the point where it is considered a reliable routine operation. Essentially, the method consists of the purification of aqueous solutions of thorium salts of the best grade available by more or less standard precipitation techniques, the thorium being retained in solution where necessary through the formation of a soluble complex. Thorium is recovered as the pure oxalate by a double precipitation from homogeneous solution. The final step, the ignition of the oxalate to the oxide, is concerned primarily with preventing the addition of impurities rather than with effecting further purification. (auth)

8824 UCRL-3700
California. Univ., Berkeley. Radiation Lab.
A STUDY OF THE ISOMERIZATION OF C^{14}-LABELED PERINAPHTHENE. Masao Nakazaki. Mar. 28, 1957. 15p. Contract W-7405-eng-48. $0.20(OTS).

Perinaphthene labeled at the number 8 position with C^{14} has been synthesized. Upon a variety of oxidative degradations it has been shown that the perinaphthene molecule behaves as though it were in a rapid tautomerism, so that positions 2 and 5 are equivalent to position 8. (auth)

8825 UCRL-3757
California. Univ., Berkeley. Radiation Lab.
AQUEOUS CHEMISTRY OF RUTHENIUM IN THE +2, +3, AND +4 OXIDATION STATES: SPECIES, SPECTRA, AND POTENTIALS (thesis). Howard Hamilton Cady. June

1957. 81p. Contract W-7405-eng-48. $13.80(ph OTS); $4.80(mf OTS).

A method for the identification of ions in solution has been developed which utilizes the properties of ion exchange resin. It is possible to determine the charge on an ion in solution and its degree of polymerization. The method was checked with known ions and used to isolate and establish the formulas of Ru^{3+}, $RuCl^{2+}$, and $RuCl_2^+$. In this investigation the above ions were identified and the existence of uncomplexed Ru(2+), and polymeric Ru(4-) were shown. In addition, evidence was found for intermediate oxidation-state compounds of Ru with oxidation states between +3 and +4, and between +4 and +5. Potentiometric titrations were carried out in order to measure the electrode potentials of the various "uncomplexed" Ru couples. (auth)

8826 WADC-TR-55-30(Pt. 5)

Pennsylvania State Univ., University Park. Petroleum Refining Lab.

FLUIDS, LUBRICANTS, FUELS AND RELATED MATERIALS. [Period covered] January through December 1956. E. Erwin Klaus and Merrell R. Fenske. Feb. 1957. 250p. Project Nos. 3044 and 7331. Contract AF33(616)-2851.

Experiments were carried out directed toward the development of improved hydraulic fluids and jet engine lubricants for use in the temperature range 400 to 700°F. Efforts were concentrated on the study of mineral oils, hydrocarbons, and esters of improved stability for application to high-temperature systems, new and improved test techniques were developed or applied to the high-temperature evaluation of hydraulic fluids and jet engine lubricants. [See also WADC-TR-55-30(Pt. 4).] (W.L.H.)

8827 AEC-tr-2937

DETERMINATION OF MERCURY IN AIR AND THE ABSORPTION OF MERCURY VAPORS BY METALLIC GOLD. Vladimir Majer. Translated by K. S. Bevis from Collection Czech. Chem. Communs. 8, 339-48(1936). 9p.

Methods are presented for the determination of Hg vapor in air. (W.L.H.)

8828

OXIDATION OF HAFNIUM. W. W. Smeltzer and M. T. Simnad (Carnegie Inst. of Tech., Pittsburgh). Acta Met. 5, 328-34(1957) June.

Hafnium oxidation rates at 760-mm O_2 pressure in the temperature range 350 to 1200°C have been represented by logarithmic, parabolic, and linear-rate equations. The respective activation energies for the rate constants were 11.4, 36.0, and 26.1 kcal/mole. The value of the parabolic rate constant was independent of O_2 pressure in the range 10 to 760 mm. Transformation from parabolic linear oxidation was caused by formation of duplex scale of inner compact and outer porous oxides. Monoclinic HfO_2 was identified as the surface oxide by x-ray examinations; marker measurements showed that oxygen diffused inward through the oxide to react with Hf at the metal/oxide interface. (auth)

8829

THE DETERMINATION OF THE CHARGE OF SOME INORGANIC THORIUM COMPLEXES WITH THE ION EXCHANGE METHOD. K. F. Schulz and M. J. Herak (Yugoslav Academy of Sciences and Arts and Inst. Ruder Bošković, Zagreb, Croatia). Croat. Chem. Acta 29, No. 1, 49-52(1957).

The charges of complex thorium chloride ions in solutions with NaCl, HCl, LiCl, KCl, $MgCl_2$, and $CaCl_2$ have been determined by means of an ion exchange technique. (T.R.H.)

8830

THE MICROWAVE SPECTRA AND STRUCTURE OF $CF_2 = CH_2$, $CF_2 = CHD$ AND $CF_2 = CD_2$. Walter F. Edgell, Philip A. Kinsey, and Jonathan W. Amy (Purdue Univ., Lafayette, Ind.). J. Am. Chem. Soc. 79, 2691-3(1957) June 5.

The K-band microwave spectra of CF_2CH_2, CF_2CHD, and CF_2CD_2 have been recorded and analyzed. With the assumptions that $\angle HCH = DCD = 120°$ and $r_{CD} = r_{CH} = 0.009$ A., the following structural parameters have been calculated: $r_{CF} = 1.321 \pm 0.005$ A., $r_{CC} = 1.311 \pm 0.005$ A., $\angle FCF = 109° 15' \pm 25'$, $r_{CH} = 1.10 \pm 0.05$ A. (auth)

8831

LEWIS ACID CHARACTER OF TELLURIUM HEXAFLUORIDE. E. L. Muetterties and W. D. Phillips (E. I. du Pont de Nemours Co., Wilmington, Del.). J. Am. Chem. Soc. 79, 2975(1957) June 5.

8832

GASEOUS DETONATIONS IN MIXTURES OF CYANOGEN AND OXYGEN. H. Milton Peek and R. G. Tharp (Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys. 26, 740-5(1957) Apr.

Precise experimental data are compared with precise theoretical values for the detonation velocities of several gaseous mixtures of cyanogen and oxygen. The results of this comparison show that these detonation processes are pathological in the sense of the theory of Kirkwood and Wood. Because of the lack of chemical kinetic data, it is not possible to calculate correct detonation velocities for these pathological detonations. Therefore, the determination of detonation velocities is not a worthwhile method for the determination of precise values of thermodynamic properties in mixtures of cyanogen and oxygen. (auth)

8833

ISOTOPE EFFECTS IN DIFFUSION CROSS-SECTIONS FOR FLEXIBLE HYDROCARBONS. J. K. Clarke and A. R. Ubbelohde (Imperial Coll. of Science and Tech., London). J. Chem. Soc. 2050-5(1957) May.

Mass diffusion coefficients have been measured for straight- and branched-chain C_7- and C_8-alkanes. Comparisons between hydrogen, deuterium, and helium as carrier gases have permitted estimates of the relative importance of low mass and of high internal energy quanta in leading to anomalously large collision "diameters" (the "hydrogen effect") for flexible hydrocarbons. Nitrogen and argon have also been used as carrier gases for reference. Results show anomalies which are in the sequence $H_2 > D_2 > He$. (auth)

8834

THE SZILARD-CHALMERS REACTION IN POTASSIUM COBALTICYANIDE. Herbert Rauscher and Garman Harbottle (Brookhaven National Lab., Upton, N. Y.). J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 155-70(1957).

Dissolution of neutron-irradiated $K_3Co(CN)_6$ in water produces Co^{2+} and anionic species having 6, 5, and 4 cyanides per cobalt. The distribution of active Co among these ions as a function of pH and thermal annealing has been investigated, and the data have been interpreted in terms of recoil fragments, also having 6, 5, and 4 cyanides per cobalt, in the crystal following irradiation. We have interpreted the observed re-formation of $Co(CN)_6^{3+}$ during thermal annealing as due to a recombination of cyanide with tetra- and pentacyano fragments. (auth)

8835

THE CHEMISTRY OF THORIUM. VIII. SOME ELECTROCHEMICAL CHARACTERISTICS OF ANHYDROUS THORIUM CHLORIDE IN ANHYDROUS ETHYLENEDIAMINE. Therald Moeller and Thirumalusubbu Muniyappan (Univ. of Illinois, Urbana). J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 216-19(1957).

Anhydrous $ThCl_4$ dissolves vigorously and readily in

anhydrous ethylenediamine. The resulting solutions show the conductance behavior of solutions of weak electrolytes. Electrolysis of such solutions give cathodic evolution of hydrogen and transport of Th to the anode compartment, but does not give cathodic deposition of Th metal. (auth)

8836

THE PREPARATION OF THIN FILMS OF PLUTONIUM, AMERICIUM, AND CURIUM BY AN ELECTROLYTIC METHOD. G. N. Yakovlev, P. M. Chulkov, V. B. Dedov, V. N. Kosyakov, and Y. P. Sobolev. J. Nuclear Energy 5, No. 1, 159-61(1957).

Methods for quantitative electrodeposition of Pu, Am, and Cm, on metallic surfaces were developed. The elements were deposited as hydroxides from neutral and weakly acidic alcoholic solutions of the chlorides. (M.H.R.)

AEROSOLS

8837 KAPL-1014

Knolls Atomic Power Lab., Schenectady, N. Y.

KAPL AIR CLEANING PROGRAM. L. J. Cherubin and J. J. Fitzgerald. Jan. 4, 1954. Changed from OFFICIAL USE ONLY June 3, 1957. 44p. Contract W-31-109-Eng-52. $0.30(OTS).

A brief description of the air-cleaning requirements at the Knolls Atomic Power Laboratory is given. A total of 407,600 cfm of air is cleaned. The CWS-6 filter units are used to clean approximately 80% of the air at the Laboratory. Caustic scrubbers and an electrostatic precipitator are utilized in specific air-cleaning operations. The efficiency of the air-cleaning units is indicated by the low concentrations of radioactive and toxic materials in the environs. The data are tabulated. The collection efficiencies of six filter media used for air cleaning and air sampling are tabulated as a function of face velocity and particle size. (auth)

8838 UR-474

Rochester, N. Y. Univ. Atomic Energy Project.

A STUDY OF SOME PHYSICAL PROPERTIES OF AN AEROSOL IN RELATION TO AIRBORNE DECAY PRODUCTS OF RADON. Thomas T. Mercer. Nov. 8, 1956. 115p. Contract W-7401-eng-49. $0.60(OTS).

ANALYTICAL PROCEDURES

8839 DP-202

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

IDENTIFICATION OF FLUORINE-17 ACTIVITY IN HEAVY WATER MODERATOR. Malcolm L. Ernst. Feb. 1957. 9p. Contract AT(07-2)-1. $0.15(OTS).

Fluorine-17, a positron emitter with a half life of 66 seconds, was identified as a major radioactive constituent in the heavy water moderator of Savannah River reactors. Coincidence measurements were used to determine the gamma rays resulting from the annihilation of positrons. (auth)

8840 IGO-AM/W-77

Gt. Brit. Windscale Works, Sellafield, Cumb., England.

THE SAMPLING OF CARBON DIOXIDE UNDER PRESSURE PRIOR TO THE DETERMINATION OF OIL. Mar. 8, 1957. 7p.

Oil in fine droplet form and as vaporized oil is extracted from the CO_2 by passage through CCl_4. (auth)

8841 AEC-tr-2929

GENERAL PRINCIPLES FOR RAISING THE ACCURACY OF QUANTITATIVE ANALYSIS METHODS AND THEIR APPLICATION TO THE PHOTOELECTRIC COLORIMETRIC METHOD OF OPTICAL COMPENSATION. K. A. Snesarev. Translated from Trudy Komissii Anal. Khim. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk 4, 282-99(1952). 17p.

8842

DIFFERENTIAL SPECTROPHOTOMETRIC DETERMINATION OF URANIUM AND NIOBIUM. Charles V. Banks, Keith E. Burke, Jerome W. O'Laughlin, and James A. Thompson (Iowa State Coll., Ames). Anal. Chem. 29, 995-8(1957) July.

A rapid and accurate differential spectrophotometric method is given for analysis of binary alloys of U (90%) and Nb. Uranium is determined by measuring absorbance of U^{6+} in 50% H_2SO_4 at 420 mμ. Niobium is determined in another aliquot by measuring absorbance of Nb–H_2O_2 complex in concentrated H_2SO_4 at 360 mμ. (auth)

8843

ACTIVATION ANALYSIS OF TRACE IMPURITIES IN TUNGSTEN USING SCINTILLATION SPECTROMETRY. James F. Cosgrove and George H. Morrison (Sylvania Electric Products Inc., Flushing, N. Y.). Anal. Chem. 29, 1017-19(1957) July.

A very sensitive quantitative method for determination of trace impurities in W is based on activation by thermal neutrons. After separation of radioactive tungsten by precipitation with α-benzoinoxime, impurities are identified and measured by gamma scintillation spectrometry. Method possesses a sensitivity of 0.001 to 1 γ for many elements. (auth)

8844

DETERMINATION OF NEPTUNIUM-239 COUNTING EFFICIENCY. W. S. Lyon (Oak Ridge National Lab., Tenn.). Anal. Chem. 29, 1048-50(1957) July.

Method for determination of absolute disintegration rate of Np^{239} is described. Counting efficiency for Np^{239} for a number of counters has been obtained by preparing the 23.5-minute U^{239}, determining absolute disintegration rate by 4 π beta-gamma coincidence counting, and later counting its daughter, Np^{239}. (auth)

8845

PARTICLE SIZE DETERMINATION BY RADIOACTIVATION. Bernard M. Abraham, Howard E. Flotow, and Roger D. Carlson (Argonne National Lab., Lemont, Ill.). Anal. Chem. 29, 1058-60(1957) July.

A rapid and reliable sedimentation method has been developed for determination of particle size of UO_2 powders in NaK alloy. Powder is first activated by neutron bombardment. Resultant activity that radiates from a thin lamina of suspension is a measure of weight of material in lamina. Method can be used for any radioactive powder in any fluid. (auth)

8846

DIFFERENTIATING TITRATION OF ACID MIXTURES IN ACETONE. James S. Fritz and Stanley S. Yamamura (Iowa State Coll., Ames). Anal. Chem. 29, 1079-84(1957) July.

Phenols, carboxylic acids, enols, imides, and sulfonamides can be titrated in acetone using a tetraalkylammonium hydroxide in benzene-methanol as titrant. Titrations are followed potentiometrically using a calomel cell containing potassium chloride in methanol and a glass electrode. Differentiating titrations are possible in many cases. (auth)

8847

COLORIMETRIC DETERMINATION OF MICROGRAM AMOUNTS OF TUNGSTEN IN URANIUM–TANTALUM–TUNGSTEN ALLOYS. Clark E. Bricker and Glenn R.

Waterbury (Los Alamos Scientific Lab., N. Mex.). Anal. Chem. 29, 1093-5(1957) July.

A rapid hydroquinone colorimetric procedure is used to determine microgram amounts of W in U–Ta–W alloys. Measurements are made at 478 mμ. Tantalum does not interfere and a reliable correction is made for the small absorbance of U. Average recovery of W in solutions containing 50 to 150 γ was 99.8%. (auth)

8848

SPECTROPHOTOMETRIC DETERMINATION OF BORON IN HIGH-TEMPERATURE ALLOYS BY QUINALIZARIN METHOD. A. H. Jones (General Motors Corp., Detroit, Mich.). Anal. Chem. 29, 1101-5(1957) July.

Boron in high-temperature alloys can be determined spectrophotometrically in range from 0.01 to 0.10% by its reaction with quinalizarin in sulfuric acid. No separations are necessary as colored ions are compensated for by using portion of sample solution as reference. Titanium interference can be corrected. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

8849

THE HEAT CAPACITY OF SOLID DEUTERIUM BETWEEN 0.3 AND 13°K. O. D. Gonzalez, David White, and H. L. Johnston (Ohio State Univ., Columbus). J. Phys. Chem. 61, 773-80(1957) June.

The heat capacity of solid normal deuterium and solid mixtures containing 3, 14.5 and 18.5% para deuterium were measured from 1.3 to 13°K. in a Nernst-type calorimeter. Measurements of the heat capacity of normal deuterium were extended down to 0.3°K. using a calorimeter partially filled with ferric alum to cool the deuterium sample by adiabatic demagnetization. The heat capacity of solid deuterium for all ortho-para compositions except 3% para exhibits an anomaly beginning at approximately 10°K. In normal deuterium, the anomaly reached a maximum at approximately 1.3°K. The anomalous entropy for normal deuterium was found to be 0.60 ± 0.04 e.u. and the associated heat content 1.44 ± 0.08 cal. mole of n-D_2. The anomalous entropy is assumed to correspond to removal of the rotational degeneracy of the "frozen-in" state J = 1. It is shown that the anomaly in solid deuterium is not of the Schottky type, and it is suggested that the effect may be coöperative. The lack of the experimental data of a λ-type transition characteristic of coöperative phenomena may be due to the dilution effect of the ortho molecules in the solid system. Assuming that the J = 1 state is split into two substates m = 0 and m = ± 1 by the crystalline field, the average energy difference between the two states has been estimated from the ΔH for the anomaly to be 6.5 cal. $mole^{-1}$. (auth)

FLUORINE AND FLUORINE COMPOUNDS

8850

IMPERFECTIONS IN THE STRUCTURE OF NEUTRON-IRRADIATED LITHIUM FLUORIDE: SUBMICROSCOPIC CAVITIES. Marianne Lambert and Andre Guinier. Compt. rend. 244, 2791-4(1957) June 3. (In French)

Central diffusion of x rays revealed some cavities in neutron-irradiated LiF. Their dimensions and concentration were determined as a function of radiation intensity and thermal annealing. (auth)

8851

THE STATE OF FLUORIDE IN DRINKING WATER. Isaac Feldman, Donald Morken, and Harold C. Hodge (Univ. of Rochester, N. Y.). J. Dental Research 36, No. 2, 192-202 (1957) Apr.

The dissociation of Na_2SiF_6 in water was studied. The hydrolysis constants for SiF_6^{2-} and SiF_4 were found to be 7×10^{-32} and 7×10^{-26} at 29°C. (T.R.H.)

8852

AN INVESTIGATION OF FUSED-SALT SYSTEMS BASED ON THORIUM FLUORIDE. II. V. S. Emelyanov and A. I. Evstyukhin. J. Nuclear Energy 5, No. 1, 108-14(1957).

On the basis of thermal, x ray, and other analyses, phase diagrams have been constructed of the system NaF–ThF_4, which includes four chemical compounds (Na_4ThF_8, α-Na_2ThF_6, β-Na_2ThF_6, $NaThF_5$, $NaTh_2F_9$), and of the system KF–ThF_4, which comprises six chemical compounds (K_5ThF_9, K_3ThF_7, $K_3Th_2F_{11}$, $KThF_5$, KTh_2F_9, KTh_6F_{25}). In an x ray examination of melts of the system NaF–KF–ThF_4, the compound $NaK(ThF_6)$ was found, and its structure determined. A triangular portion of the NaF–Na_2ThF_6–$KThF_5$–KF constitution diagram has been plotted, and the polythermal section NaF–$KThF_5$ constructed. (auth)

8853

IONIZATION POTENTIALS OF HYDROGEN FLUORIDE AND THE GROUND-STATE OF THE HF^+ ION. J. A. R. Coope, D. C. Frost, and C. A. McDowell (Univ. of British Columbia, Vancouver). Nature 179, 1186(1957) June 8.

8854

PARAMAGNETIC RESONANCE OF IMPURITIES IN NaF. B. Bleaney and W. Hayes (Clarendon Lab., Oxford). Proc. Phys. Soc. (London) B70, 626-8(1957) June.

The paramagnetic resonance spectrum of a single crystal of NaF has been observed before and after irradiation with gamma rays, electrons, and neutrons, and also after annealing. Results are summarized and analyzed. (M.H.R.)

Refer also to abstract 8839.

LABORATORIES AND EQUIPMENT

8855 HW-47022(Rev.)

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

USE OF HOOD CELLS FOR ENCLOSING LOW LEVEL RADIATION PROCESSES. Homer A. Moulthrop. Feb. 28, 1957. 11p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The design of hood cells for enclosing low-level radiation processes is discussed. The study includes maintenance, equipment changes, operating costs, corrosion and safety. (W.L.H.)

8856 IDO-14396

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

ANALYTICAL CONTROL LABORATORY OPERATING MANUAL. M. J. Painter and G. A. Huff, comps. and eds. Mar. 21, 1957. 140p. Contracts AT(10-1)-205. $0.70 (OTS).

This manual describes briefly the theory and operational procedure of apparatus and instruments used in the Analytical Control Laboratory. Also, it contains pertinent facts and information dealing with Control Laboratory operation. The manual is divided into twelve major sections; General Information, Safety and Security, Accountability, Precision and Accuracy, Records, Dilution Factors, Laboratory Equipment (Warm Laboratory), Remote Apparatus ("B" Line), Remote Apparatus ("A" Line), Training and Testing, Table of Conversion Factors and References. (auth)

RADIATION EFFECTS

8857 WADC-TR-56-534(Pt. II)
Stanford Research Inst., Menlo Park, Calif.
NUCLEAR RADIATION EFFECTS ON STRUCTURAL PLASTICS AND ADHESIVES. PART II. EXTENSION OF LITERATURE SURVEY. R. Y. Mixer and Shirley B. Radding. Mar. 15, 1957. 37p. Project title: ANPP SUPPORT. Task title: RADIATION EFFECTS. Contract AF33(616)-3632.

An abstract bibliography on radiation effects on polymers, polymerization, and organic materials is continued. (See also NP-6244.) (T.R.H.)

8858
EFFECTS OF RADIATION ON MATERIALS. Julius J. Harwood (Office of Naval Research, Washington). Metal Progress 71, No. 6, 72-4(1957) June.

Discussions are presented of changes in metallic properties by extreme irradiation by neutrons and gamma rays. These are explainable by displacement of atoms in the crystalline lattice or introduction of new atoms. Certain new organic compounds of quasi-crystallinity were produced by intense radiation. (W.L.H.)

8859
DEPOLYMERIZATION OF HYALURONIC ACID BY X-RAYS. Antonio Caputo. Nature 179, 1133-4(1957) June 1.

8860
ON THE DIRECT EFFECT OF X-RAYS ON PROTEIN. Klaus Dose. Strahlentherapie 102, 522-5(1957) Apr. (In German)

The primary effect of an x-ray dose of from 2 to 30 million r on crystallized lysozyme was investigated. Irradiation originates a number of closely related, but less basic proteins of different molecular weights, whose amino-acid components are partly transformed into other compounds. Of the terminal amino-acids, the carboxyl terminal amino-acids only showed distinct changes. The biologic activity remained practically unchanged up to a dose of 5 million r. (auth)

8861
CONTRIBUTION TO THE EFFECT OF IONIZING RAYS ON VITAMINS. I. THIAMINE AND RIBOFLAVIN. Hans-Joachim Maurer and Robert Dittmeyer. Strahlentherapie 102, 531-4(1957) Apr. (In German)

The authors give a short survey on the hitherto made observations in the irradiation of vitamins. Irradiation tests carried out by themselves with thiamine and riboflavin have shown that already relatively small doses produce a clear influence in the vitamin molecules, that buffered solutions are more stable towards x rays than aqueous, and that there are distinct differences between the effects of ultraviolet light and x rays in riboflavin. (auth)

8862
INDUSTRIAL USES OF FISSION PRODUCTS. S. Jefferson. pp. 153-4 in (Disposal of Industrial Waste Materials. New York, The Macmillan Co., 1957. 158p).

A brief discussion of the uses of fission product radiation in initiating chemical reactions, producing physical changes, and sterilizing of food is presented. (T.R.H.)

Refer also to abstract 8783.

RARE EARTHS AND RARE-EARTH COMPOUNDS

8863
THE CRYSTAL STRUCTURE OF MONOCLINIC Sm_2O_3. Don T. Cromer (Los Alamos Scientific Lab., N. Mex.). J. Phys. Chem. 61, 753-5(1957) June.

In this paper the structure of the type "B" rare earth sesquioxide is reported. This form of Sm_2O_3 is monoclinic, probable space group C2/m with $a = 14.17_7$, $b = 3.63_3$, $c = 8.84_7$, all $\pm$ 0.01 Å., and $\beta = 99.96 \pm 0.03°$. There are six formula units per unit cell. There are layers of composition Sm_2O_3 at $y = 0$ and $y = \frac{1}{2}$. Parallel to the xy-plane, layers of oxygen atoms alternate with layers of samarium atoms. Each samarium atom has seven oxygen neighbors at an average distance of about 2.46 Å. (auth)

SEPARATION PROCEDURES

8864 DOW-156
Dow Chemical Co. Western Div., Pittsburg, Calif.
DIRECT SOLVENT LEACHING OF URANIUM ORES WITH ALKYL PHOSPHATES. J. E. Magner. May 1, 1957. 55p. Contract AT-30-1-GEN-236. $9.30(ph OTS); $3.60(mf OTS).

A process for the recovery of U from ores by direct leaching with organic solutions containing alkyl H_3PO_4 and concentrated H_2SO_4 is described. The process is applicable to carnotite ores and presents savings by reducing the consumption of acid and eliminating the sand-slime separation and clarification steps involved in aqueous leaching. (auth)

8865 GAT-DR-226
Goodyear Atomic Corp., Portsmouth, Ohio.
MULTICOMPONENT GASEOUS DIFFUSION SEPARATION. R. H. Newell. Apr. 29, 1957. 6p. Contract AT(33-2)-1. $1.80(ph OTS); $1.80(mf OTS).

An algebraic method is presented for the solution of a 4- component gaseous diffusion cascade. At present the development is restricted to a single enricher, theoretical separation factor and the assumption of no losses. No insurmountable obstacles are foreseen in the extension of this work. (auth)

8866 IDO-14409
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
APPARATUS FOR REMOTE, SMALL SCALE, LIQUID-LIQUID EXTRACTIONS. Fred W. Dykes and Richard G. Masterson. May 21, 1957. 9p. Contract AT(10-1)-205. $0.15(OTS).

An improved apparatus for small-scale liquid-liquid extractions is described. The apparatus is used in the preparation of highly radioactive sample aliquots for conventional analysis. (auth)

8867 JENER-48
Joint Establishment for Nuclear Energy Research, Kjeller, Norway.
SEPARATION OF PLUTONIUM FROM IRRADIATED URANIUM, AND FRACTIONATION OF LONG-LIVED FISSION PRODUCTS BY ION EXCHANGE. Rolf O. Lingjaerde. Apr. 1957. 8p.

Fractionation of long-lived fission products in connection with separation of Pu from a solution of irradiated U is shown. Ruthenium^{106}, Sr^{90}, and Cs^{137} plus U are separated from Pu, Ce^{144}, and Pm^{147} on a cation exchange resin. The latter two are successfully removed from the contamination with Pu on an anion exchange resin. Methods of identification of the different fission products are given. (auth)

8868 KAPL-1748
Knolls Atomic Power Lab., Schenectady, N. Y.
A ONE-CYCLE PROCESS FOR THE RECOVERY AND DECONTAMINATION OF PLUTONIUM. Terminal Report. H. Ward Alter, R. Fowler, Jr., and J. L. Mewherter. Jan. 2, 1957. 29p. Contract W-31-109-Eng-52. $0.25(OTS).

A flowsheet for the recovery and decontamination of Pu

from spent reactor fuel is described. The chemical bases of the flowsheet are presented, together with results from ten laboratory and nine pilot plant runs. Pu meeting activity specifications are obtained from the process. The main problems of rare earth fission product decontamination, Fe decontamination, and capacity, can probably be solved with suitable flowsheet and equipment modifications. (auth)

8869 ORNL-2269

Oak Ridge National Lab., Tenn.

PROGRESS REPORT ON RAW MATERIALS FOR FEBRUARY 1957. K. B. Brown, C. F. Coleman, D. J. Crouse, and A. D. Ryon. June 17, 1957. 32p. Contract W-7405-eng-26. $0.25(OTS).

Some new organophosphorus and organonitrogen compounds are described, together with some new batches of compounds previously tested. Uranium extraction power in standard tests is reported. Loss rates by distribution from organic to aqueous solutions are reported for some amines and for a quaternary ammonium compound (Rohm and Haas Quaternary B-104). Batch tests of Amex extraction and stripping of U and Mo confirmed a considerable variation in tendency toward amine-molybdenum precipitation with choice of amine-diluent combination. The same tests also showed a strong dependence of precipitation on Mo concentration in the organic phase. Two continuous countercurrent tests were completed with no precipitation observed. Rohm and Haas Experimental Quaternary B-104, dimethyldidodecenylammonium chloride (converted to carbonate before use), in Amsco G, Amsco G-tridecanol, or kerosene-tridecanol extracted U well from Na_2CO_3 and $NaHCO_3$ solutions. Extraction decreased with increasing total carbonate concentration and with increasing temperature, and increased with increasing tridecanol content through most of the range tested. Some long-chain alcohol content (e.g., 5% tridecanol) was required in the kerosene but not in the Amsco G to prevent third phase formation; the alcohol improved phase separation with both diluents. Stripping of the extracted U was highly effective with 1M NaCl solution and was promising with 2 and 3M NaOH solution. Dapex uranium extraction rates in tank mixer batch tests at fairly low U loading levels were well represented by first-order rate constants. (For preceding period see ORNL-2268.) (auth)

8870 ORNL-2321

Oak Ridge National Lab., Tenn.

USE OF ION EXCHANGE RESINS TO CONCENTRATE RADIONUCLIDES FOR SUBSEQUENT ANALYSIS. Bernd Kahn, Edwin R. Eastwood, and William J. Lacy June 17, 1957. 18p. Contract W-7405-eng-26. $0.20(OTS).

A procedure for determining low levels of radionuclides in water has been developed. Radioactive Cs, Sr, Ce, and Co are concentrated from one liter samples of river water by cation exchange resins and then purified by standard radiochemical techniques. The radionuclides and their carriers are absorbed on resin from 0.001M HCl solutions and then eluted with 20 to 25 ml of strong HCl or HNO_3. Sensitivity of detection has been increased by this method from approximately 10^{-6} to 10^{-8} μc/ml The method was utilized to perform radiochemical analyses of ORNL Settling Basin and Clinch River waters. (auth)

8871 RMO-2801

Colorado School of Mines Research Foundation, [Inc.]. Golden.

RECOVERY OF URANIUM VALUES FROM ORE AND CONCENTRATE SAMPLES. Progress Report No. 1. Sept. 10, 1954. 119p. CSMRF Project No. 530208. Contract AT(49-6)-916. $0.60(OTS).

The uraninite in an ore sample was concentrated by 5 different methods. At a mesh size of minus 100 plus 200, at least 90% of the uraninite is still attached to other minerals, and by virtue of preferential attachment to certain minerals, separation is considered possible. The magnetic concentration method showed promise and the gravity concentration method gave some beneficiation but poor recovery. The electrostatic, scrubbing, and flotation methods were unsatisfactory. (T.R.H.)

8872 WIN-68

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

AMENABILITY TESTING OF HOMESTAKE NORTH ALICE MINE ORE. H. I. Viklund and E. J. Hammond. May 20, 1957. 23p. Contract AT(49-6)-924. $4.80(ph OTS); $2.70(mf OTS).

The results of laboratory amenability testing of an ore sample from the Homestake Mining Co., North Alice Mine, in Big Indian Wash District of Utah, are presented. (auth)

8873 WIN-72

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

PILOT PLANT INVESTIGATION OF THE ACID LEACH-FILTRATION-SOLVENT EXTRACTION PROCESS AS APPLIED TO RIO DE ORO DYSART SHAFT ORE. R. G. Beverly, D. O. Skiles, and R. L. Shimmin. Mar. 29, 1957. 57p. Contract AT(49-6)-924. $9.30(ph OTS); $3.60(mf OTS).

From January 4 to February 18, 1957, operation of the Acid Leach–Filtration–Solvent Extraction Pilot Plant was studied with Rio de Oro Dysart Shaft ore from the Ambrosia Lake area in New Mexico as the ore feed. This report contains information on grinding and leaching of the ore, filtration of the leach residue, solvent extraction of the leach liquor, stripping of the pregnant solvent, and precipitation of yellow cake. The test work was divided into two periods. The first period was conducted with triisoöctyl amine as the solvent extractant. High solvent entrainment losses and precipitation of a molybdenum–amine compound in the solvent circuit led to the second period of test work during which Amine 9D-178 was the extractant. (auth)

8874

LOOK FOR NUCLEAR FUEL REPROCESSING BY '65. Frank R. Bruce (Oak Ridge National Lab., Tenn.). Chem. Eng. 64, No. 7, 202, 204, 206(1957) July.

The economics of processing spent power reactor fuels are discussed. (W.L.H.)

8875

NUCLEAR FUEL REPROCESSING. ITS STATUS AND DIRECTION. Edward L. Anderson, Jr. (Atomic Energy Commission, Washington). Chem. Eng. Progr. 53, No.6, 19-22 (1957) June.

The economics of nuclear fuel reprocessing is discussed. (T.R.H.)

8876

THE SEPARATION OF CARRIER-FREE Y^{90} FROM Sr^{90} BY ELECTROLYSIS. Gerald Lange, Günter Herrmann, and Fritz Starssmann. J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 146-54(1957). (In German)

The electrolytic deposition of Y^{90} from weak aqueous HNO_3 for the separation of carrier-free Y^{90} from Sr^{90} has been investigated. The Y^{90} is deposited on the cathode with a yield of 90 to 98%. Through repetition of the electrolysis, Y^{90} can be prepared with less than 10^{-4}% Sr^{90}. (auth)

8877

THE REMOVAL OF PLUTONIUM BEFORE THE ANALYSIS OF MIXED FISSION PRODUCTS. G. Phillips and E. N. Jenkins (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 220-4(1957).

Methods are presented for the complete removal of up

to 100 mg of Pu as an initial step in the radiochemical analysis of certain individual products in irradiated Pu metal of Pu–U alloy. (auth)

8878

ATMOSPHERIC vs. PRESSURE LEACHING OF URANIUM ORES. R. G. Beverly, A. W. Griffith, and W. A. Millsap (National Lead Co.). J. of Metals 9, 746-51(1957) June.

Test work was performed to study the effects of several variables on leaching of uranium ores in carbonate solutions. Many of these variables had been investigated in the laboratory, but pilot plant tests were desirable to evaluate their importance in semi-works equipment and to predict optimum operating conditions for future commercial mills. The results of these tests should serve as a guide in selecting the most efficient and economical method of leaching uranium ores amenable to a carbonate process. This paper is concerned with a process in which uranium is extracted from the ore by a hot Na_2CO_3–$NaHCO_3$ solution; the uranium bearing solution is separated from the solid residue by filtration, and uranium is then precipitated by chemical means. (auth)

8879

AMMONIUM CARBONATE PRESSURE LEACHING OF URANIUM ORES. B. G. Langston, R. D. Macdonald, and F. M. Stephens, Jr. (Battelle Memorial Inst., Columbus, Ohio). J. of Metals 9, 752-6(1957) June.

The data obtained have demonstrated that the $(NH_4)_2CO_3$ pressure leach is a technically attractive method for extraction of U from high-lime ores. As in the case of other processes developed for the extraction of U from domestic ores, the process does not appear applicable to high gypsum or high V ores. On the other hand, with its low reagent cost for precipitation and the recovery of substantially all of the ammonia, the process appears to have advantage over other alkaline leach processes. In addition, because of these same factors, it is probably competitive with an acid leach of medium-lime ores. At the same time, because an acid leach usually will extract about 98 % of the U from low-lime ores, the acid leach still appears to maintain its advantages. The advantages and disadvantages of the several methods available for extracting U from low-grade ores are such that a careful economic comparison should be made for each ore being considered. (auth)

8880

URANIUM RECOVERY BY THE SOLVENT EXTRACTION PROCESS. James D. Moore (Vitro Uranium Co., Salt Lake City, Utah). J. of Metals 9, 757-61(1957) June.

It is observed that solvent extraction processes will become even more valuable in the production of uranium products. The inherent flexibility and wide choice of reagents offer a seemingly unlimited number of combinations and possibilities for purification of uranium from ores to final high grade salts. (auth)

8881

NEW HORIZONS FOR LITHIUM. P. E. Landolt. J. of Metals 9, 766-8(1957) June.

8882

FUSED-FLUORIDE PROCESSING OF SPENT URANIUM FUEL. Archie G. Buyers (Atomics International, Canoga Park, Calif.). Nucleonics 15, No. 6, 86-9(1957) June.

A fused-fluoride processing experiment at ORNL is described. Uranium irradiated to 95 g Pu/ton of U and cooled for 2½ yr. was melted at 1573°K with UF_4, CaF_2, and LiF. The equilibration results, giving distribution of Pu and fission products in the melt, are tabulated and plotted in a useful form. (T.R.H.)

8883

THE THEORY OF ION EXCHANGE DYNAMICS. IV. THE EQUATION FOR THE MOVEMENT OF A STEADY FRONT. V. V. Rachinskii (Moscow, Williams Inst. of Water Engineering). Zhur. Fiz. Khim. 31, 445-51(1957) Feb. (In Russian)

An equation has been developed for the steady front in the dynamic sorption of univalent ions. The theoretical results were tested experimentally by a radiochromatographic method; the experimental and theoretical data proved to be in good agreement. (tr-auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

Refer to abstract 8877.

URANIUM AND URANIUM COMPOUNDS

8884

THE HEAT OF SOLUTION OF URANIUM TETRACHLORIDE AND THE HYDROLYSIS OF THE URANIUM(IV) ION. J. A. Hearne and A. G. White (A.E.R.E., Harwell, Didcot, Berks). J. Chem. Soc. 2081-5(1957) May.

Measurements have been made of the heat of solution of anhydrous UCl_4 in aqueous HCl–LiCl mixtures at constant ionic strength. The variation of the heat of solution with HCl concentration is in apparent disagreement with current views on the U^{4+} and an explanation is offered in terms of the effect of the electrolyte in the solvent on the solvation energy of UCl_4. (auth)

8885

HYDROLYSIS OF THE URANYL ION. J. A. Hearne and A. G. White (A.E.R.E., Harwell). J. Chem. Soc. 2168-74 (1957) May.

The pH of uranyl perchlorate solutions has been measured over a wide concentration range at various temperatures and ionic strengths. The results can be explained in terms of two hydrolytic reactions, leading respectively to the formation of the monomeric $UO_2 \cdot OH^+$ and the dimeric $UO_2 \cdot UO_3^{2+}$ ion, ΔH for formation of the former being considerably larger than for the latter. The effect of complex formation with anions is discussed and a new method of detecting perchlorate-complex formation is suggested. (auth)

8886

HIGH PRESSURE DISSOCIATION STUDIES OF THE URANIUM HYDROGEN SYSTEM. G.G. Libowitz and Thomas R. P. Gibb, Jr. (Tufts Univ., Medford, Mass.). J. Phys. Chem. 61, 793-5(1957) June.

Pressure–composition isotherms were obtained for the U–H_2 system over the temperature range 450 to 650° at pressures up to 65 atm. in a stainless steel apparatus designed for high temperature high pressure measurements. The experimentally determined plateau pressures are compared with values extrapolated from low temperature studies of Spedding and Flotow and Abraham. A value of −30.3 kcal./mole was obtained for the heat of formation of UH_3 from the dissociation pressure data. (auth)

8887

THE FIRST FERRO-URANIUM MADE IN AMERICA. Clarence T. Patterson (Solvay Process Co., Syracuse, N. Y.). Metal Progress 71, No. 6, 85-9(1957) June.

A history of the research, production, and uses of ferro-uranium in the U. S. is given. (W.L.H.)

WASTE DISPOSAL

8888 KAPL-364(Pt. III)

Waste Processing Committee, AEC.

MEETING OF THE AEC WASTE PROCESSING COMMIT-

TEE [HELD AT KNOLLS ATOMIC POWER LABORATORY], JUNE 26-28, 1950. PART III. L. L. German, ed. Oct. 11, 1950. Changed from OFFICIAL USE ONLY June 3, 1957. 51p. $6.30(ph OTS); $3.00(mf OTS).

Suggested maximum permissible levels for alpha and beta radiation in waters outside areas of control are given. Methods of monitoring water at K-25 and Hanford are described. Attempts to beta assay liquid waste solutions of high salt content are described. Methods of monitoring municipal water supplies are discussed. A discussion is given on the monitoring of solutions containing low levels of radioactivity. (W.L.H.)

8889

DISPOSAL OF INDUSTRIAL ATOMIC WASTE PRODUCTS. R. H. Burns and E. Glueckauf. pp. 145-52 in (Disposal of Industrial Waste Materials. New York, The Macmillan Co., 1957. 158p).

Industrial atomic waste disposal in Britain is discussed. The quantities, composition, and properties are given, along with predictions of future requirements. The methods presently used, the legal position, and the special problem of fission product gases are considered. (T.R.H.)

ENGINEERING

8890 KAPL-M-WEC-10

Knolls Atomic Power Lab., Schenectady, N. Y.

STRUCTURAL SIGNIFICANCE OF APPLIED LOADINGS. A SUMMARY OF DESIGN METHODS. W. E. Cooper. Apr. 2, 1957. 30p. Contract W-31-109-Eng-52. $4.80 (ph OTS); $2.70(mf OTS).

The various methods used for the evaluation of the structural significance of applied loadings are reviewed. Included are discussions of the various industrial codes as well as the structural design basis for reactor pressure vessels for naval service, and a discussion of the various activities which are directed toward modification or improvement of these methods. In addition, one subsection deals specifically with the subject of thermal stress in nuclear reactors as something which is "different" and not necessarily considered as completely in the design of conventional apparatus. (auth)

8891 NARF-57-16T

Convair, Fort Worth, Tex.

REMOTE HANDLING EXPERIMENT. P. L. Marjon and B. A. Kress. May 15, 1957. 34p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-152).

An exploratory experiment in the completely remote maintenance of radioactive aircraft components is described. A method of approach to the problem is established and information is presented which will enable more realistic investigations in the remote handling art for aircraft applications. (auth)

HEAT TRANSFER AND FLUID FLOW

8892 ANL-5590

Argonne National Lab., Lemont, Ill.

CROSS-ROD MATRICES: FLOW FRICTION BEHAVIOR AND RECOMMENDED THERMAL DESIGN DATA. James F. Matousek. Apr. 1957. 47p. Contract W-31-109-eng-38. $0.35(OTS).

Basic heat transfer and flow friction design data on crossed-rod matrices of interest as potential geometries for fuel elements for certain types of nuclear reactors are presented in graphical, non-dimensional form. Flow friction data for in-line and staggered arrangement cover a Reynolds Number range of 6,000 to 50 000 and may be extrapolated, at least tentatively, to 4 000 and 100,000. The porosity of the in-line and staggered matrices studied ranged from 0.39 to 0.75, and the recommended interpolation or extrapolation to the higher porosities is given. Experimental studies at Argonne are combined with results of tests by Stanford University on random stacked geometries to give recommended heat transfer and flow friction data for random, in-line, and staggered crossed-rod matrices. A staggered crossed-rod matrix is preferred over the "in-line" geometry because it affords a lower friction factor at higher Reynolds Numbers, and a more favorable arrangement of points of contact between successive layers of rods with consequent reduction in hot spots normally encountered in fuel element design. On the basis of heat transfer power obtained per pumping power expended, the staggered matrix shows significant advantage over plate-type elements. (auth)

8893 HW-38242(Rev. 1)

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

EXPERIMENTAL STUDIES ON STEAM–WATER PRESSURE DROPS IN AN ANNULUS WITH HEAT TRANSFER. C. R. McNutt and M. W. Carbon. Oct. 10, 1955. 27p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70 (mf OTS).

Pressure drops are reported for forced circulation flow of steam-water mixtures in a 23.5 ft long, 1.43 inch ID, 0.1 inch thick, horizontal annulus. The inner surface of the annulus was uniformly heated over a range from 97,000 to 233,000 Btu/hr-ft^2, exit pressures extended from 100 to 500 psig, and exit steam qualities varied from 0 to 60% by weight. Liquid water entered the annulus and boiling lengths up to 15 feet were investigated. Moreover, the Woods and the Martinelli and Nelson methods of calculating two-phase pressure drop were applied to the experimental conditions, and the deviations between the analytical and the test results are presented. (auth)

8894 NACA-TN-3655

Lewis Flight Propulsion Lab., Cleveland.

METHOD OF CALCULATING CORE DIMENSIONS OF CROSSFLOW HEAT EXCHANGER WITH PRESCRIBED GAS FLOWS AND INLET AND EXIT STATES. E. R. G. Eckert and Anthony J. Diaguila. Dec. 8, 1955. 25p.

A calculation procedure is presented for determining the dimensions of a heat-exchanger core with a prescribed heat-transfer surface. The procedure is applicable when the gas-flow quantities as well as the inlet and outlet gas conditions on both sides of the heat exchanger are specified. The procedure is applied to a numerical example. (auth)

8895 T-53(RAND)

ON THE PROBLEM OF COOLING ATOMIC ROCKETS WHICH UTILIZE THERMONUCLEAR REACTIONS. H. J. Kaeppeler. Translated by R. L. Bjork from Proc. Intern. Congr. Aeronautics, 4th Congr., Zurich, 1953. 41p.

The adequacy of screen cooling at extemely high temperatures, such as appear in atomic jet engines was investigated. As a preface it was shown that at relatively low pressures, relatively high temperatures are required for the enthalpy of heating necessary to attain exhaust velocities greater than 10 to 15 km/sec. It is shown in conclusion that the use of uranium reactors at these temperatures is not feasible. For an eventual application of thermonuclear reactions as an energy source to heat a working medium, a cooling method is investigated which should permit very high temperatures. In particular the motion of the medium in the rocket chamber as well as the heating and heat conductivity problem are treated. A formulation of the "complete" heat conductivity coefficient, including

energy transfer due to radiation, is given. The theoretical results show that an adequate cooling capacity may be expected. Possibilities toward the experimental evaluation of the theoretical investigation are discussed. (auth)

8896

THE TRANSITION PROCESS AND OTHER PHENOMENA IN VISCOUS FLOW. E. Rune Lindgren. Arkiv Fysik 12, No. 1, 1-8(1957).

An account of experiments on the transition process and other phenomena of liquid flow, mainly in cylindrical tubes, is given. Discussions are included on the properties of bentonite sols, the change between laminar and turbulent flow of liquids in cylindrical tubes, use of the stream double refraction technique in studying flow phenomena, simultaneous observations of the transition process in liquid flow at various pairs of locations along long cylindrical tubes, studies on the onset of turbulence in liquid flow by means of simultaneous pressure drop measurements, and the context of the present experimental findings in view of observations reported in the literature. (M.H.R.)

8897

CALCULATE FLUIDIZED HEAT TRANSFER BY NOMOGRAPH. Chin-Yung Wen and Liang-Tseng Fan (West Virginia Univ., Morgantown). Chem. Eng. 64, No. 7, 254-7 (1957) June.

Methods are given for calculating heat transfer in fluidized beds using nomographs. (W.L.H.)

8898

ON THE LAMINAR FLOW OF AN ELECTRICALLY CONDUCTING LIQUID UNDER THE INFLUENCE OF A TRANSVERSE MAGNETIC FIELD. Etienne Crausse and Yves Poirier. Compt. rend. 244, 2694-5(1957) May 27. (In French)

A mathematical treatment is given the laminar flow of a conducting viscous liquid in a straight conduit of uniform cross section, a uniform magnetic field of exterior origin being exerted normal to the axis of the conduit. (T.R.H.)

8899

HYDRODYNAMIC PROBLEMS INVOLVING LARGE FLUID DISTORTIONS. Francis H. Harlow (Los Alamos Scientific Lab., N. Mex.). J. Assoc. Computing Machinery 4, No. 2, 137-42(1957) Apr.

MATERIALS TESTING

8900 CF-57-5-45

Oak Ridge National Lab., Tenn.

EVALUATION OF COATED Al_2O_3 AND TUNGSTEN CARBIDE BEARING-JOURNAL ASSEMBLIES IN WESTINGHOUSE 100A PUMP. Summary of Runs S-96A and S-97. A. S. Kitzes and C. A. McLaughlin. May 3, 1957. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Preliminary results of tests with the Westinghouse 100A pump indicate that Al_2O_3 and WC coated bearing-journal assemblies prepared by the Linde process are not promising as substitutes for the graphitar–stellite combination. The front Al_2O_3 assembly failed at start-up with water and both front and rear WC assemblies failed after 121 hours with water at 245°C. (auth)

8901 MAB-118-M

National Research Council. Materials Advisory Board. UNIFORM TESTING PROCEDURES FOR SHEET MATERIALS. PART 1. GENERAL PROCEDURES. PART 2. TENSION TEST. Report No. 2 of Task Force on Uniform Procedures for Structural Design Data Collection. May 31, 1957. 18p. Contract DA-49-025-sc-83.

To provide some basis for uniformity in evaluating various Ti alloys, a uniform set of procedures is being prepared for procuring the data. (W.L.H.)

8902

IMMERSED ULTRASONIC INSPECTION OF PIPE AND TUBING. R. B. Oliver, R. W. McClung, and J. K. White (Oak Ridge National Lab., Tenn.). Non-Destructive Testing 15, 140-4(1957) May–June.

The immersed ultrasonic inspection of the pipe and tubing used in nuclear power reactors is described in detail. The instrument used is adaptable to both the thin sections of small tubing down to $^3/_{16}$ in. OD and pipe of 8-in. diameter. It also lends itself well to continuous inspection at high rates of travel. (auth)

8903

ULTRASONIC TRANSMISSION TESTER. J. D. Ross and R. W. Leep (E. I. DuPont de Nemours & Co., Aiken, S. C.). Non-Destructive Testing 15, 152-4(1957) May–June.

Through-transmission of an ultrasonic beam is a convenient method of testing objects for internal flaws. By this technique, an ultrasonic pulse is transmitted through the object under inspection and the received pulse is checked for abnormal attenuation. The abnormally attenuated pulses can be counted as the object is scanned, and the total count is a measure of the area over which the defect extends. (auth)

VACUUM SYSTEMS

8904

VACTROLLER. A LABORATORY VACUUM CONTROLLER. C. J. Penther (Shell Development Co., Emeryville, Calif.). Rev. Sci. Instr. 28, 460-3(1957) June.

Pirani gages are used in an a-c bridge circuit to sense deviation from the set point, and with the aid of a proportional leak valve, control the pressure of laboratory-scale vacuum systems over the range of 0.1 to 10,000 μ of Hg. Pressure fluctuations from the controller action are negligible and stability of ± 1% has been obtained over long periods without operator attention. Set point is easily adjustable by panel control knob. Commercial components are used except for the leak valve which is of special construction. (auth)

8905

THERMAL-emf-FREE VACUUM SEAL FOR ELECTRICAL LEAD WIRES. T. S. Noggle, T. H. Blewitt, R. R. Coltman, and C. E. Klabunde (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 28, 464(1957) June.

The vacuum seal developed for low-temperature pile irradiations in the ORNL graphite reactor makes use of Castolite cold setting plastic to form a flange directly onto the lead wires. This plastic undergoes a volume contraction during polymerization which leads to a strong mechanical joint between the plastic and wires and contributes to vacuum tightness. (M.H.R.)

8906

UNIQUE SLIDING SEAL FOR A VACUUM CHAMBER. Frank I. Loucks, Jr. (Naval Research Lab., Washington). Rev. Sci. Instr. 28, 468-9(1957) June.

The vacuum seal consists of a flexible strip sliding over an O-ring. The strip is made of 0.005-in. type 304 stainless steel, with angle stiffeners of 0.01-in. stainless steel, spot welded across the strip. (M.H.R.)

8907

ALLOY-FILLED CUTOFF FOR HIGH TEMPERATURES. S. Toby and K. O. Kutschke (National Research Council, Ottawa, Can.). Rev. Sci. Instr. 28, 470-1(1957) June.

A Wood's alloy cutoff, two of which have been used continuously for a year at temperatures up to 200°C, is described. The alloy is allowed to cool only when it is in a

stainless steel reservoir sealed onto the Pyrex. A sketch of the cutoff and an experimental vapor pressure curve of Wood's alloy, compared to Cd and Hg are included. (M.H.R.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

8908 WADC-TR-57-32
Brush Beryllium Co., Cleveland.
A STUDY OF HOT PRESSING OF BERYLLIA ROCKET NOZZLES. [Period covered] June 1956 through November 1956. Chester A. Bielawski, Theodore M. Harkulich, and Russell E. Long. Dec. 1956. 57p. Project title: CERAMIC AND CERMET MATERIALS. Task title: CERAMIC AND CERMET MATERIALS DEVELOPMENT. Contract AF33(616)-56223. (AD-118278).

A preliminary investigation was conducted on the variables of particle size, temperature, pressure, and time as related to the fabrication of beryllia rocket-nozzle throat inserts by hot pressing. Results of this work were applied toward the fabrication of twenty, 100-pound-thrust throat-insert specimens which were submitted for evaluating the feasibility of using this material in uncooled rocket motors. The twenty specimens were composed of four groups representing variations in starting materials with regard to particle size and purity and variations in fabrication procedures, including time, temperature, and heat treatments, which affected the final structure. (auth)

8909 AEC-tr-2928
HEATS OF FORMATION FOR BORIDES OF SOME TRANSITION METALS. G. V. Samsonov. Translated from Zhur. Fiz. Khim. 30, 2057-60(1956). 6p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 11-1915.

8910
THE PHYSICO-CHEMICAL AND ELECTRICAL PROPERTIES OF THE TiO_2-ZrO_2 SYSTEM. Ya. M. Ksendzov and V. G. Prokhvatilov. Zhur. Tekh. Khim. 31, 320-7(1957) Feb. (In Russian)

Investigations revealed that the $ZrTiO_4$ compound, and solid solutions of rutile and ZrO were formed at the boundaries of the TiO_2-ZrO_2 system. At 400°C the solid solution of rutile was found between 11 and 12 mole % of ZrO_2, while tetragonal ZrO was present at ~15% TiO_2. With the increase of temperature, the solid solution boundaries shifted towards higher solute concentrations. The electrical properties of the TiO_2-ZrO_2 system were studied. For the compound $ZrTiO_4$, the value of ϵ was 39, and the temperature coefficient was 110×10^{-6}. (tr-auth)

CORROSION

8911 CF-57-4-55
Oak Ridge National Lab., Tenn.
SOLUTION CORROSION GROUP QUARTERLY REPORT FOR THE PERIOD ENDING APRIL 30, 1957. J. C. Griess, H. C. Savage, J. L. English, R. S. Greeley, S. R. Buxton, D. N. Hess, W. C. Ulrich, and T. H. Mauney. Apr. 30, 1957. 46p. Contract [W-7405-eng-26]. $7.80(ph OTS); $3.30(mf OTS).

A third test of the mockup of the Zircaloy-2 stainless steel transition joint used in the HRT reactor vessel was completed. Corrosion of stainless steel in 0.04m UO_2SO_4 containing equimolal $BeSO_4$ was no greater at 10 to 15 fps (flow rate) and much less at 15 to 75 fps, than in HRT solution at 200 and 225°C. Corrosion of a variety of materials in boiler water at 250°C was determined at several O_2 concentrations. The addition of 50 ppm Cl^- to 0.17m UO_2SO_4 produced pitting at 250°C and stress-corrosion cracking at 200°C on type 347 stainless steel when O_2 exhaustion was allowed to occur. Bromide concentrations of 100 and 200 ppm in boiling and aerated 0.04m UO_2SO_4 solution containing 0.02m H_2SO_4, and 0.005m $CuSO_4$ were found to produce cracking in stressed type 347 stainless steel. Pertechnetate concentrations of 60 ppm and less in oxygenated distilled water at 300°C containing 100 ppm Cl^- were completely ineffective in preventing corrosion of type 347 stainless steel. Zirconium-base alloys were exposed for 1000 hr at 300°C in oxygenated 0.04m UO_2SO_4 solution containing 0.02m H_2SO_4 and 0.005m $CuSO_4$. Some alloys exhibited corrosion behavior comparable to that of Zircaloy-2. The rate of attack by boiling 5 wt. % HNO_3 solution on deposits of stellite-6 was reduced markedly by pre-exposure in boiling 3 wt. % Na_3PO_4 solution. Tests to detect porosity of gold plate on type 347 stainless steel bellows are reported. Alsemags 192(TiO_2) and 652 (96 wt. % Al_2O_3) exhibited superior corrosion resistance to high purity Kearfott Al_2O_3 in oxygenated 1.33m UO_2SO_4 solution at 250°C. (For preceding period see CF-57-144.) (W.L.H.)

8912
CORROSION RESISTANCE OF ZIRCALOY-2 BRAZEMENTS IN HIGH-TEMPERATURE WATER. J. B. McAndrew, H. Schwartzbart, and R. Necheles (Armour Research Foundation, Chicago, Ill.). Welding J. (N. Y.) 36, 287s-90s (1957) June.

Brazements of simple geometry with Zircaloy-2 base metal were subjected to corrosion test in 680° F pressurized water for periods up to and sometimes exceeding 1200 hr. The filler metals used to prepare the corrosion test specimens included a large number of experimental alloys devised specifically for this purpose. Instances were observed in which specimens survived this test with little or no evidence of attack. (auth)

GEOLOGY AND MINERALOGY

8913 RME-3147
Well Instrument Developing Co., Bellaire, Tex.
DEPARTURE CURVES AND ELECTRODE FACTORS FOR THE DETERMINATION OF TRUE FORMATION RESISTIVITY FROM ELECTRIC LOGS OBTAINED WITH ROLLER TYPE ELECTRODES IN AIR DRILLED BORE HOLES NOT CONTAINING FLUID. John A. Pranglin. Jan. 4, 1957. 12p. Contract AT(05-1)-725. $0.20(OTS).

The development, by use of an electric resistivity analogue computer and an electrolytic tank model, of suitable departure curves and electrode factors from which true resistivities could be determined from the resistances obtained by electric logging of air drilled bore holes with pad type (roller) electrodes was attempted. Measurements were made with the resistivity analogue with various arrangements of bed thickness and resistivity to establish the departure curves. Measurements were made with the electrolytic model to determine the electrode factors for three bore-hole sizes and for one, two, and three rollers. It was found that the electrode factors were independent of both the bore-hole size (from 2 to 6 inches) and the position of the rollers on the mandrel (with the positions used). (auth)

8914
THE SPONTANEOUS FRAGMENTATION OF THORIANITE ON HEATING. R. S. Barnes and D. J. Mazey (Atomic

Energy Research Establishment, Harwell, Berks). J. Nuclear Energy 5, No. 1, 1-3(1957).

Natural thorianite, containing large amounts of helium from the radioactive decay processes occurring in it, fragments explosively at 950°C when slowly heated. This behavior is attributed to the helium precipitating as high-pressure gas at flaws in the mineral. (auth)

8915

ON THE MODE OF OCCURRENCE OF URANIUM IN PHOSPHATE ROCKS. I. G. Chentsov. J. Nuclear Energy 5, No. 1, 146-8(1957).

Investigations of apatite derived from uranium-bearing phosphate rocks have established that uranium enters the crystal lattice of apatite and forms urano-apatite. (auth)

METALS AND METALLURGY

8916 AGC-AE-18

Aerojet General Corp., Azusa, Calif.

THE REACTION OF MOLTEN METAL WITH WATER. Progress Report [for] March 1 through April 30, 1956. June 6, 1956. Decl. Jan. 15, 1957. 6p. Contract AT(04-3)-44. (AGC-L2914-16). $1.80(ph OTS); $1.80(mf OTS).

Experiments were performed to determine the reactivity of molten pure Al and Zircaloy-B with water. Oxidation tests were also performed on molten droplets of Zr, Zircaloy-2 and Zircaloy-B. Photographs of the representative droplets are included. (W.L.H.)

8917 ANL-5690

Argonne National Lab., Lemont, Ill.

THE FABRICATION OF CERTAIN JACKETED URANIUM HELICES. F. L. Yaggee. May 1957. 19p. Contract W-31-109-eng-38. $0.20(OTS).

The fabrication of jacketed, U helical elements is described. In brief, the elements consisted of $\frac{1}{8}$ in. diameter by 12 ft long U core completely enclosed within a stainless steel or nickel jacket. This was wound into a helix as a spring having a prescribed inside diameter and spacing between turns. (W.L.H.)

8918 IGR-TN/W-513

Gt. Brit. Windscale Works, Sellafield, Cumb., England.

SOME ELEVATED TEMPERATURE HARDNESS MEASUREMENTS ON MAGNOX C ALLOY. D. Shaw and P. N. Sharratt. May 1957. 9p.

Hardness measurements have been made on Magnox C alloy at various temperatures up to 500°C; firstly, with varying loads and a constant time of application of load, and, secondly, with varying times of application of load and a constant load. The Meyer index decreased from 2.5 at room temperature to approximately 2.0 at temperatures of 350°C and higher. A general empirical relationship existing between the mean pressure of indentation and the yield stress has been used to determine the maximum tensile stresses at temperatures of 350°C and higher. At temperatures higher than room temperature, the hardness decreases with time of application of load. Above 200°C, the rate of decrease of hardness is slight after times of 1200 seconds. (auth)

8919 KAPL-1763

Knolls Atomic Power Lab., Schenectady, N. Y.

THE KINETICS OF MOLTEN METAL–WATER REACTIONS: A REPORT ON Na_2K–WATER VAPOR. H. M. Saltsburg. Apr. 30, 1957. 36p. Contract W-31-109-Eng-52. $0.30(OTS).

A method has been suggested for the experimental study of the kinetics of the reaction of molten metals with vapors so that the reactive metal surface is relatively free from films of reaction product and the vapor flow is definable, not only in terms of pressure and composition, but also in a hydrodynamic sense. In this manner, the influence of vapor phase processes upon the heterogeneous reaction may be determined. Preliminary experiments are reported for NaK alloy (78% potassium) reacting with water vapor. Certain experimental difficulties are noted which make quantitative interpretation of the data not feasible at this time. Possible solutions are suggested. (auth)

8920 NP-6324

Carnegie Inst. of Tech., Pittsburgh. Lab. for Magnetics Research.

THE MAGNETIC SUSCEPTIBILITY OF SOME DILUTE ALLOYS OF NICKEL IN COPPER AND MAGNESIUM IN LITHIUM. Technical Report No. 7. Emerson William Pugh. Aug. 1956. 108p. Project NR-017-703. Contract N7-onr-30307.

The magnetic susceptibilities of pure Cu and dilute Cu–Ni alloys containing 0.59, 1.16, and 2.48 at. % Ni have been measured by the Gouy method between 300°K and 2.4°K. The anomalous temperature dependence previously reported for similar alloys was not observed. A model, recently advanced for these alloys, assumes that Ni atoms dilutely alloyed in Cu are in the $3d^{10}$ configuration unless thermally excited. A calculation of the susceptibility contribution of such atoms (in the appendix) indicates a temperature dependence not observed experimentally. The susceptibility of each of these alloys is shown to be described by an equation of the form $K = a\,T + b + c/T$, and the significance of each term is discussed. Eddy current problems accompanying susceptibility measurements of highly conducting samples are discussed in detail. A Gouy balance especially designed for measuring susceptibilities of such samples at low temperatures is described. A second order correction for ferromagnetic impurities is suggested for use with the Honda plot. Susceptibility measurements made in this Laboratory on Li are compared with recently obtained spin resonance values of the conduction electron paramagnetism. Good agreement is indicated between the experimental susceptibility values and values calculated by D. Pines. Susceptibility measurements on some Li–Mg alloys indicate no anomalously large diamagnetic contribution with increasing Mg content. (auth)

8921 NP-6328

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

THE INFLUENCE OF CERTAIN MICROSTRUCTURAL CONFIGURATIONS ON THE TENSILE PROPERTIES OF TITANIUM ALLOYS. Final Report [for] January 15, 1956 to March 15, 1957. Sheldon A. Spachner and Arthur G. Metcalfe. 71p. ARF Project No. B 097. Contract Nonr-1846(00).

A study was made of the relationship of tensile mechanical properties to forging practice and microstructure in two commercial titanium alloys, Ti–7Al–3Mo and Ti–3Mn–1Cr–1Fe–1Mo–IV (Ti–3Mn Complex). Forging practice was varied by holding the forging temperature range above or below the beta transus temperature. Material forged below the beta transus was forged to 20%, 50%, and 70% reductions in area at this temperature range. Microstructural variations were effected by varying the coarse alpha size and coarse alpha-to-beta ratios by appropriate heat treatment. It was found that equiaxed coarse alpha structures possess superior strength and ductility compared to Widmanstatten structures. The optimum reduction in area by sub-transus forging, from the standpoint of mechanical properties, is 50% for both alloys. Variation in the size of the coarse alpha for an arbitrary ratio of coarse alpha to beta has little influence on the tensile strength, yield, or ductility in the Ti–7Al–3Mo alloy. The

tensile properties of the Ti–3Mn Complex alloy are sensitive to the size of the coarse alpha. The tensile properties of both alloys are considerably influenced by the volume proportion of the coarse alpha to age-hardenable beta, for a given coarse alpha size. A relative increase in the amount of beta phase generally increases the tensile strength and decreases the ductility. (auth)

8922 NRL-4919

Naval Research Lab., Washington, D. C.

EXPLOSION-BULGE-TEST PERFORMANCE OF LOW-CARBON Ni–Cr–Mo–B QUENCHED AND TEMPERED STEEL WELDMENTS. P. P. Puzak. Apr. 5, 1957. 12p.

A cooperative test program was established to investigate the weldability of a proprietary quenched and tempered alloy steel of interest to the Navy. The effects of several welding variables (restraint, moisture, microcracks, orientation, and preheat) were investigated and results are discussed. Explosion bulge tests were conducted at 30, 0, and –50°F. Irrespective of the variable introduced, all twelve weldments resisted one shot of explosive at all test temperatures without visible signs of failure. Thus, for "general case" service applications (pressure vessels, tanker, or cargo ships, etc.) it is deemed that Y-steel weldments would perform satisfactorily at all ambient temperatures. The ultimate fractures developed in the bulge tests are characterized by low-energy shear tearing characteristics predominantly associated with the heat-affected zone. From the limited test data, it is not known whether Y-steel weldments would be suitable for all Naval structures in which design must be based on "accident case" loading conditions. It is clear, however, that this material is not suitable for applications based on "military service" loading conditions. The characteristics of the plate material are in conformance with the predictions of Charpy V and drop-weight tests. (auth)

8923 TML-72

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

POROSITY IN FORMED TITANIUM. R. A. Wood, D. N. Williams, H. R. Ogden, and R. I. Jaffee. May 17, 1957. 40p. Contract AF18(600)-1375.

A new type of material failure has been found in parts formed of commercial-purity titanium. Surface pitting and internal voids are formed in areas of the part which have been highly strained. The phenomenon has been named strain-induced porosity. A study of the occurrence of this phenomenon showed that deformation temperature, amount of strain, strain rate, state of stress, and amount and kind of impurity could affect the degree of the porosity. The same kind of porosity has been found to occur in many other metals and alloys, and it is believed to be a normal part of the mechanism of deformation in ductile materials. (auth)

8924 WADC-TR-56-481

Kaiser Aluminum and Chemical Corp., Spokane.

POWDER FABRICATION OF ALUMINUM ALLOYS. [Period covered] February 1, 1955 through August 31, 1956. S. G. Roberts. Nov. 13, 1956. 82p. Project title: METALLIC MATERIALS. Task title: ALUMINUM ALLOYS. Contract AF33(616)-2296. (AD-118192).

A new approach to aluminum alloy development, involving the use of powder metallurgy techniques to produce "superalloys" of aluminum, is described; and the preliminary results obtained in an evaluation survey of aluminum alloy systems using this approach are given. These results show that, by this approach, excellent prospects exist for the development of aluminum base alloys having improved mechanical properties at elevated temperatures. The alloy systems found to show promise as a base for alloy development were Al–Mn, Al–Fe, Al–Ti and Al–Cr. Mixtures of aluminum alloy powders and low density refractory carbides having high moduli of elasticity were fabricated by hot compaction and extrusion, and evaluated by tensile testing at room and elevated temperature (600°F) and by microscopic examination. These fabrications were found to have high moduli of elasticity but were generally inferior in tensile properties to fabrications of the base aluminum alloys without carbide additions. Extrusions were also prepared from Al–Cu–Mn, Al–Cu–Mg, Al–Mg and Al–Zn–Cu–Mg type alloy powders and evaluated. Significant improvements in the tensile yield strengths at 600°F were found to be effected by powder metallurgy fabrication as compared to conventional wrought fabrication for the Al–Cu–Mn and Al–Cu–Mg type alloys, but no benefits were obtained with the Al–Mg and Al–Zn–Cu–Mg type alloys. The H_2O present in the surface film of aluminum alloy powder particles was measured and its effects on the characteristics of subsequent extrusions are discussed. (auth)

8925 WADC-TR-57-154

General Electric Co. Thomson Lab., Lynn, Mass.

EFFECTS OF PROCESSING VARIABLES ON FRACTURE AND DISC-BURSTING CHARACTERISTICS OF FOUR HIGH TEMPERATURE MATERIALS. Period covered: March 1, 1955 to March 31, 1957. Richard Sakamoto. Apr. 1, 1957. 84p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(616)-2778. (AD-118346).

Generalization of notch sensitivity characteristics of materials evaluated by conventional notch rupture data without due regard to the specific application may represent an unjustified material penalty and unnecessarily preclude the use of a material for a specific application. Elevated temperature spin test data for several alloys are included which indicate that certain alloys are notch insensitive in thin disk tests even though they show significant strength reduction in the conventional notch rupture tests. This difference in behavior is attributed to the greater constraint existing in the notched cylindrical specimen and indicates that the constraint factor may be fully as significant as the stress concentration. (auth)

8926 WASH-701

Division of Research, AEC.

URANIUM ALLOY NEWSLETTER. E. Epremian, ed. Feb. 1957. Decl. Mar. 13, 1957. 38p. $0.40(OTS).

A tentative phase diagram is given of the U rich U–Ru alloy. Results of investigations on the corrosion behavior of irradiated U–Si systems are tabulated. Corrosion tests were also made on U–Zr alloys. Results are also given of the aqueous corrosion of U–Zr–Ta alloys at 290°C. Isothermal transformation kinetics of the γ phase of U–Nb and U–Nb–X alloys were investigated, and diagrams are included. Data are included on the effect of temperature and various Zr melting stocks on the corrosion behavior of Zr–U alloys in high-temperature water. The physical properties of U–Al alloys are tabulated. Data are also included on the solidification of U–Nb alloys and the M_s temperature of U–Nb alloys. (B.J.H.)

8927

OBSERVATIONS ON ETCH PITS AND SUB-BOUNDARIES IN COLUMBIUM. A. B. Michael and F. J. Heugel (Fansteel Metallurgical Corp., North Chicago, Ill.). Acta Met. 5, 339-41(1957) June.

8928

THE THERMAL ETCHING OF TITANIUM. P. Evans (California Inst. of Tech., Pasadena). Acta Met. 5, 342-5(1957) June.

8929

STRESS DISTRIBUTIONS IN ROTATING DISKS SUBJECTED TO CREEP AT ELEVATED TEMPERATURE. A. M. Wahl (Westinghouse Research Labs., Pittsburgh). J. Appl. Mechanics 24, 299-305(1957) June.

Assuming a creep rate proportional to a power function of the stress, curves of stress distribution as a function of the radius have been calculated for several cases of rotating disks subject to steady-state creep at elevated temperature. The disks are assumed to have central holes and to be uniformly loaded at the periphery (to simulate blade loading in turbine disks). It is also postulated that the Tresca (maximum-shear) criterion and the associated flow rule govern. The following cases are treated: Disk of constant temperature and thickness with various ratios of outside to inside diameter and with various values of the exponent n in the assumed power function stress-creep rate relation. Disk of constant temperature and variable thickness, the thickness at the periphery being equal to half that at the hub, for various n-values. Disk with variable temperature such that the creep rate at the outside diameter is ten times that at the inside diameter for the same stress, various n-values being assumed. Limits of radial peripheral loading beyond which the derived stress-distribution curves are not valid are also determined. The results indicate that a considerable nonuniformity in stress distribution under creep conditions may exist, particularly for the lower n-values; thus creep-rupture strengths of such disks for long-time loading conditions may be lower than would be expected if based on average stress values, particularly for materials having limited ductility in long-time creep-rupture tests. (auth)

8930

THE EFFECT OF NEUTRON IRRADIATION ON THE MECHANICAL PROPERTIES OF TITANIUM AND ZIRCONIUM. M. M. Makin and F. J. Minter (Atomic Energy Research Establishment, Harwell, Berks). J. Inst. Metals 85, 397-402(1957) May.

The changes in mechanical properties of titanium and zirconium after irradiation with 5×10^{19} neutrons/cm^2 have been studied at a variety of temperatures. The yield stress of annealed titanium increased by about 8000 lb./in.^{2} at all testing temperatures between −195 and +200° C. A yield point was developed at 200° C, which indicates the migration to dislocations of vacancies produced by the irradiation. The elongation before fracture was reduced by the irradiation at all testing temperatures and the ultimate tensile strength increased slightly. The yield stress of heavily cold-worked zirconium decreased slightly at all testing temperatures after irradiation and the ultimate tensile strength rose. The elongation before fracture also increased in marked contrast to the behavior of annealed material. The reason for this "annealing" effect in heavily cold-worked metal is discussed in terms of the atomic defects produced and also in terms of the Brinkman displacement-spike mechanism. (auth)

8931

THE URANIUM−LEAD SYSTEM. Robert J. Teitel (Brookhaven National Lab., Upton, N. Y.). J. Inst. Metals 85, 409-12(1957) May.

In order to confirm the conclusions concerning the liquid immiscibility in the lead−uranium system reached in an earlier paper, the experiments on which these conclusions were founded are described in greater detail. New data on the solubility of uranium in lead, obtained by a filtration technique, and on the crystal structure of UPb, obtained by neutron diffraction, are also presented. UPb has a body-centered tetragonal cell with $c/a = 0.961$, $a = 11.04$ A., and contains 48 atoms. The density is estimated to be 13.7 g./c.c. A discrepancy between the values for the cell size of UPb_3, as determined by Frost and Maskrey and by the present author, is discussed. According to present work, $a = 4.791$ A. and the density = 12.98 g./c.c. (auth)

8932

FACTORS IN THE SELECTION OF CORROSION RESISTANT MATERIALS. F. L. Whitney, Jr. (Monsanto Chemical Co., St. Louis, Mo.). Metal Progress 71, No. 6, 90-6(1957) June.

The selection of metals for various environments is discussed. The case of fabrication, corrosion rate, and cost are most important items, but operating factors such as temperature, concentration, purity, velocity of corrosive fluids, and erosion by sludge are of equal influence on over-all economics. (W.L.H.)

8933

AIRCRAFT ALLOYS FOR THERMAL FLIGHT UP TO 1200°F. Metal Progress 71, No. 6, 97-110(1957) June.

A discussion is presented of the problems involved in the fabrication of alloys for thermal flight up to 1200°F. (W.L.H.)

8934

TIME-TEMPERATURE EFFECT ON PROPERTIES OF WELD HEAT-AFFECTED ZONE IN TYPE 347 STAINLESS STEEL. E. F. Nippes (Rensselaer Polytechnic Inst., Troy, N. Y.), B. Schaff (Westinghouse Electric Corp., Philadelphia), and W. L. Fleischmann and R. L. Mehan (Knolls Atomic Power Lab., Schenectady, N. Y.). Welding J. (N. Y.) 36, 265s-70s(1957) June.

To obtain an understanding of the metallurgical changes occurring in the weld heat-affected zone of Type 347 stainless steel during welding and subsequently in service, an investigation was conducted. The initial report covered the establishment of the heating and cooling cycles occurring in metal-arc welding of a 1½-in. thick plate. Some data were presented which spotted the potentially troublesome area in the region heated to about 2400° F. The work which is presented concentrated on the behavior of samples heated in synthetic welding cycles to a peak temperature of 2450° F. The brief duration of that temperature was sufficient to cause concomitant grain growth and solution of the carbide phase. This condition simulated those existing in that region of actual welds where troubles were experienced. The general type of information which this work was intended to provide was to establish the time-temperature behavior of the high-temperature metallurgical structure (2450° F) established in the welding cycle. (auth)

8935

FATIGUE RESISTANCE OF SIMULATED NOZZLES IN MODEL PRESSURE VESSELS. George Welter and Julien Dubuc. Welding J. (N. Y.) 36, 271s-4s(1957) June.

All observations concerning the fatigue resistance of simulated nozzles made during fatigue tests on model pressure vessels of A201, Grade A, and A302, Grade B steels under cyclic internal pressure are presented. It was observed that all fatigue fractures in these nozzles occurred in the longitudinal direction of the pressure vessels and began at points of maximum circumferential stress concentration at the edge where the nozzle hole meets with the internal surface of the pressure vessel shell. (auth)

8936

DUCTILITY OF TUNGSTEN-ARC WELDS IN MOLYBDENUM. N. E. Weare, R. E. Monroe, and D. C. Martin (Battelle Memorial Inst., Columbus, Ohio). Welding J. (N. Y.) 36, 291s-300s(1957) June.

The objectives of this study were: (1) to study some of the variables encountered in welding molybdenum, (2) to study the possibility of welding molybdenum outside of a dry box, and (3) to determine if welds of consistent ductility could be made in different lots of arc-cast carbon-deoxi-

dized molybdenum. Good bend ductility at 25° and 75° C was found for welds made using the best procedures established for dry-box and conventional welding. Welds were made in the dry box to study the effects of cleaning methods, initial sheet microstructure, and two levels of atmosphere purity. Only atmosphere purity had a significant effect on weld ductility. Five methods of shielding welds made in air were studied and the effects of type of inert gas used, gas flow and nozzle size were determined with standard inert-gas shielding cups. A standard shielding cup and a leading-trailing shield unit have produced the best welds made in air to date. Other promising shielding methods are still being studied. The extent of tungsten contamination of molybdenum welds during tungsten-arc welding also were studied. About 3 wt. % tungsten in a molybdenum weld lowered weldment ductility. Weld porosity was associated with oxides or gas trapped along sheet edges. Welds were made in six heats of arc-cast molybdenum with about the same carbon content both in air and in the dry box for a consistency run. A significant difference in bend ductility was found between welds made in the different heats. (auth)

8937

EFFECTS OF NITROGEN ON THE SOUNDNESS AND DUCTILITY OF WELDS IN MOLYBDENUM. W. N. Platte (Westinghouse Electric Corp., Pittsburgh). Welding J. (N. Y.) 36, 301s-6s(1957) June.

The acquisition of nitrogen by molybdenum weld metal and the effects of nitrogen on mechanical and metallurgical properties were studied. Molybdenum weld metal acquires nitrogen rapidly in argon welding atmospheres containing 1% N_2 or less. Nitrogen does not cause weld porosity or hot cracking but is detrimental to low-temperature ductility. For maximum weld ductility the nitrogen in the weld metal should be held to limits close to the original metal composition. (auth)

8938

RELATIVE BEHAVIOR OF NOTCH-TOUGHNESS TESTS FOR WELDED STEEL. W. D. Murphy and R. D. Stout (Lehigh Univ., Bethlehem, Penna.) and W. D. McMullen (Westinghouse Electric Corp., Pittsburgh). Welding J. (N. Y.) 36, 307s-11s(1957) June.

Eleven structural steels in a variety of conditions were tested using the notched slow-bend (Kinzel), Naval Research Laboratory (NRL) drop-weight and V-notch Charpy tests in order to develop a basis of comparison for these tests. In addition to determining the Kinzel 1% lateral contraction transition temperature, the nil-ductility transition (NDT) temperature and the Charpy 10 ft-lb temperature, great use was made of specimen fracture appearance after testing to help analyze the results of each test. A correlation between the drop-weight NDT and the Kinzel 1% lateral contraction temperatures was found to exist when Kinzel specimen behavior reflected the ability of the base material to prevent cleavage crack propagation. A plot of NDT vs. Charpy 10 ft-lb temperature for the project steels plus steels tested at NRL revealed a scatter-band within which the two transition temperatures correlated. (auth)

TRACER APPLICATIONS

8939

A POSSIBLE GEOCHEMICAL APPLICATION OF KRYPTON-85. Saadia Amiel (Israel Atomic Energy Commission, Rehovoth) and Lester Winsberg (Weizmann Inst. of Science, Rehovoth). J. Nuclear Energy 5, No. 1, 50-1(1957).

A new method is proposed for proving the existence and estimating the size of underground uranium deposits by measuring the 10 year Kr^{85}. Chemical separation and counting methods are described. Results on one radioactive spring were inconclusive and possible explanations are advanced. (M.H.R.)

8940

THE DISTRIBUTION OF CARBON-14 IN NATURE. James R. Arnold (Princeton Univ., N. J.) and Ernest C. Anderson (Los Alamos Scientific Lab., N. Mex.). Tellus 9, 28-32 (1957).

The C^{14} activity of oceanic materials indicates that the mixing half-time for C between the atmosphere and ocean surface waters is one or two decades, while the turnover time for the ocean as a whole is several hundred years. This conclusion is consistent with estimates based on the measured decrease in C^{14} specific activity of wood grown in recent years compared with 19th century wood. (auth)

PHYSICS

8941 AECU-3492

Sandia Corp., Albuquerque, N. Mex.

WIND AND POSITION VARIABILITY FROM RAWIJET DATA. Jack W. Reed and T. E. VanZandt. Mar. 15, 1957. 25p. Contract AT(29-1)-789. (TM-61-57-51). $4.80(ph OTS); $2.70(mf OTS).

Trajectories of hourly rawin balloons are analyzed to find the dependence of the variance of wind changes on time between balloon releases and on layer thickness, and the dependence of the variance of position differences on time between releases and on time of flight. It is shown that instrument errors are negligible for all the positions and for winds averaged over layers thicker than approximately 2000 feet. For thinner layers, instrument errors are important, but for layers thinner than approximately 1000 feet, instrument errors cannot be evaluated from existing calibration runs. Application of the data to fallout problems and to observation procedure is discussed. (auth)

8942 NAA-SR-1885

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

SOLID STATE PHYSICS SEMIANNUAL PROGRESS REPORT [FOR] JULY–DECEMBER 1956. John F. Hove, ed. June 1, 1957. 40p. Contract AT-11-1-GEN-8. $0.30 (OTS).

A brief description is given of the results to date of a metallurgical study of the Th rich end of the Th–U phase diagram. Both a metallographic and a lattice structure investigation imply a room temperature solid solubility of about 1% U in Th, although some very careful electrical resistivity studies appear to indicate no unusual behavior, other than a change in the $\alpha-\beta$ transformation temperature, up to 8% U, the maximum value studied. The electrical resistivity of a U single crystal has been measured as a function of temperature (4 to 300°K), orientation, and magnetic field. The one direction in which the resistivity is markedly higher is not the same direction in which the thermal expansion coefficient is markedly different (but in this case, negative), though an anisotropic crystal will usually have one odd direction in which all the direction-sensitive properties will be different from their values in the other two directions. The Hall coefficient of a polycrystalline sample of U has been measured as a function of temperature. The value is positive and shows a striking decrease (by almost a factor of three) in the region of 50°K. A sample of high-purity Cu was measured and a similar algebraic decrease, although only by about 20%, was noted in approximately the same temperature range. The explanation is thought to lie in a hitherto uninvestigated dependence of the Hall effect on electron scattering, al-

though no quantitative theoretical explanation has been successfully formulated. The electronic energy band structure of α–Th has been worked out and a two-band approximation made to the actual energy surfaces in the vicinity of the Fermi level. Since the effective masses of the various electrons and holes are theoretically computed, only the two relaxation times can be treated as disposable constants. Evaluating these from the electrical resistivity and thermoelectric power standpoint, it is found that the Hall coefficient and magnetoresistivity can be predicted almost exactly. This agreement is very gratifying and lends a high credence to the validity of the calculations. A few preliminary measurements were made of the electrical resistivity changes of Cu and Ni under bombardment at about 10°K. Preliminary annealing measurements indicate that some 50 to 80% of the change recovers by about 60°K. The changes in Young's modulus and internal damping in Cu due to electron bombardment have been measured. The modulus rises rapidly with flux, reaching an early saturation followed by a slow decrease. The rapid rise is attributed to dislocation pinning while the slow decrease is thought to be a "bulk effect," i.e., a change due to lattice distortion and not a dislocation effect. (auth)

8943 NYO-7917

Aeroprojects, Inc., West Chester, Penna.

APPLICATIONS OF ULTRASONIC ENERGY. Progress Report No. 3 Covering Period from February 16, 1957 to April 15, 1957. May 1957. 32p. Contract AT(30-1)-1836. $6.30(ph OTS); $3.00(mf OTS).

Continued experimentation in the dissolution of stainless steel and Zircaloy-2, using close-proximity ultrasonic treatment, has resulted in the accumulation of substantial amounts of data on the effect of various reagent solutions. The use of fluoboric acid appears promising for the dissolution of Zircaloy-2; a solution of 5M nitric acid plus 1M hydrochloric acid effects satisfactory dissolution of stainless steel with applied ultrasonics. Studies on the effect of pressure and applied r-f power on the rate of dissolution of Zircaloy-2 in an 80% sulfuric acid–20% nitric acid solution indicated retardation of the corrosion rate as the pressure was increased from atmospheric up to 270 psig. Increased power at atmospheric pressure produced significantly increased corrosion rates. Subatmospheric pressure showed a negligible effect on rate of corrosion. Exploratory work indicated promise for the technique involving direct coupling of ultrasonic energy to the material to be dissolved. Fabrication of the resistance-heated, controlled-atmosphere ultrasonic furnace for the treatment of thorium bismuthide melts has been completed. Ultrasonic transducer-coupling-punch systems for introducing both axial and shear-type vibration into powdered metals during compaction have been fabricated and assembled in a 100-ton hydraulic press. (For preceding period see NYO-7916.) (auth)

8944

SOLUBILITY OF SOME POLONIUM COMPOUNDS. K. W. Bagnall and J. H. Freeman (A.E.R.E., Harwell). J. Chem. Soc. 2161-3(1957) May.

The dependence of the solubility of polonium hydroxide on hydroxyl-ion concentration indicates that this compound is only feebly acidic; the solubilities of polonium acetate and cyanide have been determined for a wide concentration range of acetic acid and potassium cyanide respectively and some observations made on a formate, oxalate, and tartrate. (auth)

8945

NUCLEAR RADIATION. NEW CHALLENGE FOR TRANSISTOR MAKERS. Henry P. Steier. Missiles and Rockets 11, No. 6, 121-2, 124(1957) June.

A discussion of the development of transistors for use in nuclear environments is presented. (W.L.H.)

8946

FUSION-REACTOR CONTROL. M. A. Schultz (Westinghouse Electric Corp., Pittsburgh). Nucleonics 15, No. 6, 76-9(1957) June.

The "black-box" approach to fusion reactor control is treated to show one type of engineering approach to an ultimate control problem. (T.R.H.)

AEROSOLS

8947

ON THE POSSIBILITY OF SEPARATE STUDIES OF LIQUID AND SOLID AEROSOL FRACTIONS IN PARTICLE DISPERSION SPECTRA. A. E. Mikirov (Inst. of Applied Geophysics). Izvest. Akad. Nauk S.S.S.R. Ser. Geofiz. 689-91(1957) May. (In Russian)

Calculations using the indicatrix of dispersion method permitted the separate measuring of liquid (spherical) and solid (non-spherical) aerosol particles. (R.V.J.)

ASTROPHYSICS

8948 AEC-tr-2927

THE MOTION OF A GAS DURING A STAR FLARE-UP (SUPERNOVA). L. I. Sedov. Translated from Doklady Akad. Nauk S.S.S.R. 111, 780-2(1956). 9p.

Fundamental problems connected with explaining observable phenomena in variable stars are studied by taking into account the mechanical effects of gas dynamics. Possible methods for obtaining high temperatures and pressures with the aid of detonations and using points on the adiabatic curve of Hugoniot above those of Chapman-Jouguet are pointed up in this investigation. (M.H.R.)

COSMIC RADIATION

8949

MESON SHOWERS BY HEAVY PRIMARY PARTICLES. Senzo Tokunaga (Saikyo Univ., Kyoto). J. Phys. Soc. Japan 12, 454-9(1957) May.

Meson showers by heavy primary particles which have energy of 500 Bev per nucleon were studied with nuclear emulsions. Dealing with the event, the nuclear disintegration cascade by heavy primary particle, it was possible to estimate the energy of the primary particle with much accuracy by two methods, one by usual median angle of shower particles and the other by the opening angle of the fragmentation products of heavy primary particle. The angular distribution of the shower particle was studied and compared with the theory of Fermi and that of Landau. (auth)

8950

AN OBSERVED COSMIC-RAY FLUX OF LIGHT ELEMENTS AT 41° N. GEOMAGNETIC LATITUDE. J. H. Noon, A. J. Herz, and B. J. O'Brien (Univ. of Sydney, Australia). Nuovo cimento (10) 5, 854-65(1957) Apr.

The relative abundances of the different charge groups of heavy cosmic-ray nuclei under less than 12 g/cm^2 of atmosphere and packing, were measured in a stripped-emulsion stack flown at geomagnetic latitude 41° N. A minimum potential range of 4.5 cm in emulsion was required for the acceptance of any track. Identification was based on measurements of δ-ray density. Charge calibration was obtained from grain counts and gap-length measurements on identified protons and deuterons coming to rest in the emulsion. The flux of Be and B was found to be comparable with that of C, N and O nuclei. (auth)

8951
MULTIPLE MESON PRODUCTION IN THE COSMIC RADIATION. E. Lohrmann. Nuovo cimento (10) 5, 1074-82 (1957) May.

Six jets were selected from about 250 found in cosmic ray plates with the aim to get events representing nucleon-nucleon collisions as closely as possible. Scattering measurements on the shower particles showed that the mean total energy of the mesons in the center of mass system was 0.35 Bev for about 100 Bev primary energy and 0.4 to 1 Bev for primary energies of 1,000 Bev and more. A large fraction of the particles has small energies in the c.m.-system, thus favoring the Heisenberg theory of multiple meson production. No relation between the anisotropy of the angular distribution in the c.m.-system and the inelasticity was found. The inelasticity seems to vary within wide limits. An analysis of the angular distribution of 6 further jets presumably produced by mesons was carried out. The mean energy of these jets was 200 Bev. The angular distribution in the c.m.-system is isotropic within the limits of error. (auth)

8952
NEW EXPERIMENTAL EVIDENCE FOR THE TUNNEL THEORY OF COSMIC RAY "JETS". C. B. A. McCusker (Dublin Inst. for Advanced Studies) and F. C. Roesler (Imperial Chemical Industries Ltd.). Nuovo cimento (10) 5, 1136-44(1957) May.

The predictions of the tunnel theory of cosmic ray jets are compared with recent experimental evidence, particularly with the detailed data of the jet found by Debenedetti et al. Excellent agreement is found between the new experimental data and the earlier theoretical predictions. A list of 74 jets with $y_p \geq 500$ is given in an appendix. (auth)

8953
PARENT STARS OF K^+ MESONS. D. F. Falla and M. W. Friedlander (Univ. of Bristol), F. Anderson (Univ. Coll., Dublin), W. D. B. Greening, S. Limentani, B. Sechi-Zorn, C. Cernigoi, G. Iernetti, and G. Poiani. Nuovo cimento (10) 5, 1203-22(1957) May.

A study was made of the parent stars of K mesons produced by cosmic radiation. Emission angle and energy spectra are given for these mesons, together with a distribution of star sizes. An estimate is made of the frequency of occurrence of associated hyperons, other K mesons and hyperfragments. Three particularly interesting events are described, including one which has enabled the mass of the negative Σ hyperon to be calculated as $2,341 \pm 6\ m_e$. (auth)

8954
OBSERVATIONS ON EXTENSIVE AIR SHOWERS. I. APPARATUS. T. E. Cranshaw and W. Galbriath (Atomic Energy Research Establishment, Harwell). Phil. Mag. (8) 2, 797-803(1957) June.

An arrangement of G. M. counters, covering an area of approximately 0.5 km^2, together with other apparatus, has been set up near Harwell, to study various aspects of extensive air showers. A general description of the apparatus is given and details of some of the electronic circuits are included. The results of the investigations and specialized apparatus for particular experiments will be described in later papers. (M.H.R.)

8955
OBSERVATIONS ON EXTENSIVE AIR SHOWERS. II. TIME VARIATIONS IN THE ENERGY REGION OF 10^{17} EV. T. E. Cranshaw and W. Galbriath (Atomic Energy Research Establishment, Harwell). Phil. Mag. (8) 2, 804-10(1957) June.

The rates of arrival of extensive air showers near sea level have been recorded over a period of almost two years. The results show no evidence for sidereal variations in the rates, and the bearing of this in theories of the origin of cosmic radiation is discussed. Evidence is presented of statistically significant variations in solar time for showers containing a mean number of particles of 3×10^7, and the significance of this is briefly discussed. (auth)

8956
THE RANDOM FUNCTIONS OF COSMIC-RAY CASCADES. T. E. Harris (Rand Corp.). Proc. Natl. Acad. Sci. U. S. 43, 509-12(1957) June.

The electron-photon cascades of cosmic radiation are considered in the formulation of previous work. Simplifying assumptions appropriate to the complete screening case are made. Hence the asymptotic results given cannot be strictly true, since such assumptions hold only over limited ranges of the parameters. (M.H.R.)

8957
ON THE STRUCTURE OF EXTENSIVE COSMIC RAY AIR SHOWERS: CORE DETECTION AND CORE STRUCTURE. E. W. Kellermann, T. Shaw, and N. Dickinson (Univ. of Leeds). Proc. Phys. Soc. (London) A70, 452-9(1957) June.

A 'core-detecting' apparatus is described for which the efficiency of core detection is uniform for central electron densities from about 20 to 200 m^{-2}. Accuracy of location of shower axes has been studied by means of decoherence curves between two identical units; more than 50% of responses are shown to arise from showers for which the axis falls within 3 m of the center of the detector. The performance of the core detector is shown to be consistent with the conclusion that the proportion of energetic electrons in the center of showers changes little over the range of shower size examined, and in particular that the smaller showers do not show the characteristics of 'old' cascades. The observations provide no evidence of any core structure of size comparable with the measured accuracy of location. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

8958
TWIN INTERSECTIONS IN TITANIUM. F. D. Rosi (RCA Labs., Princeton, N. J.). Acta Met. 5, 337-9(1957) June.

8959
LOW-TEMPERATURE DEFORMATION OF COPPER SINGLE CRYSTALS. T. H. Blewitt, R. R. Coltman, and J. K. Redman (Oak Ridge National Lab., Tenn.). J. Appl. Phys. 28, 651-60(1957) June.

Single crystals of copper were deformed at 4.2 and 77.3°K. At 4.2°K, after a large strain produced by normal slip, jerky flow (discontinuous slip) occurs. From the study of reactor irradiated crystals, it was deduced that a packet of 30 slip lines, each containing 10^4 dislocations, was released to form each jerk of the discontinuous flow. For samples of certain orientation the region of discontinuous flow was followed by a region of deformation twinning. The fact that deformation twinning was taking place was verified by x ray methods. The twinning elements were determined to be the (111) plane and the [112] direction. At 77.3°K, discontinuous slip was not observed. In a limited range of orientations, twinning has been observed at 77.3°K. The effects of reactor irradiations on discontinuous slip and on twinning were also studied and it was determined that the occurrence of twinning was unaffected by the irradiations. (auth)

ELECTRICAL DISCHARGE

8960 NRL-4944
Naval Research Lab., Washington, D. C.
ON A SELF-CONSISTENT FIELD METHOD FOR A COM-

PLETELY IONIZED GAS. E. G. Harris. Apr. 15, 1957. 21p. Project NR 550-002.

The state of a plasma is described by phase-space distribution functions for the electrons and ions. These functions satisfy Boltzmann equations without collision terms. The average electric and magnetic fields appear in the Boltzmann equations, and these average fields satisfy Maxwell's equations which contain average charge and current densities. A derivation of this set of equations based on Liouville's theorem is presented. The principle assumption made is that a two-particle distribution function may be adequately approximated by a product of single-particle distribution functions. A class of time-independent problems is considered in which the set of equations may be reduced to two or three coupled ordinary differential equations. The method is applied to problems of the confinement of a plasma by a magnetic field, the pinch effect, and nonlinear plasma oscillations. (auth)

8961 AEC-tr-2725

ON THE THEORY OF STRIATIONS. A. A. Vlasov and I. P. Bazarov. Translated from Zhur. Eksptl.' i Teoret. Fiz. 20, 1098-1108(1950). 13p.

A nonlinear theory of the periodic distribution of electrons in a plasma has been developed which makes it possible to determine the amplitude A of the oscillations of the potential in the striated positive column. Here the boundaries of the plasma are taken into account and it is shown that the intensity of the striations is damped in the direction of motion of the electrons. Comparison with experiment leads to satisfactory results for the amplitude A. (auth)

8962

AN INVESTIGATION OF A HIGH-CURRENT GAS DISCHARGE IN A LONGITUDINAL MAGNETIC FIELD. A. L. Bezbatchenko, I. N. Golovin, D. P. Ivanov, V. D. Kirillov, and N. A. Yalinsky. J. Nuclear Energy 5, No. 1, 71-85 (1957).

A gas discharge in deuterium has been investigated at currents of up to 700 kA in a longitudinal magnetic field of up to 12,000 oersted. The influence of the field on the development of the discharge column was detected. Estimates are given of the plasma conductivity and the ionization coefficient. (auth)

8963

ON THE STABILITY OF A CYLINDRICAL GASEOUS CONDUCTOR IN A MAGNETIC FIELD. V. D. Sharafranov. J. Nuclear Energy 5, No. 1, 86-91(1957).

Hydrodynamical conditions are obtained for the stability of an ideal cylindrical gaseous conductor in an external magnetic field. (auth)

ELECTRONS

8964

THE ANGULAR DISTRIBUTION OF ELECTRONS IN THE COMPTON EFFECT. Radha Ramam Roy, Marie-Louise Goes, and Isidore Kozlowitz. Compt. rend. 244, 2706-7 (1957) May 27. (In French)

A study of the angular distribution of Compton electrons is reported. A Mn^{54} gamma ray source of 835 kev was used. The experimental results are in accord with the Klein–Nishina theory. (tr-auth)

8965

NONLAMINAR FLOW IN CYLINDRICAL ELECTRON BEAMS. Kenneth J. Harker (Bell Telephone Labs., Murray Hill, N. J.). J. Appl. Phys. 28, 645-50(1957) June.

Experimental measurements on the transverse velocity distribution in cylindrically symmetric electron beams emergent from magnetically shielded cathodes are reported. For strong magnetic fields the transverse velocity distribution at the beam center has been found to be composed of discrete classes. These results are explained on the basis of a beam model with nonlaminar flow in which thermal velocities and space charge are neglected. The mechanism depends on the periodic passage of electrons through or very near the beam axis and the fact that the wavelength of this periodicity is a decreasing function of the distance between the point of entry into the magnetic field and the axis. When the space charge and magnetic forces are comparable, no discrete transverse velocity distribution was observed. It is shown, however, that the beam should still be in the same type of nonlaminar flow as above. (auth)

8966

THE SPIN KINEMATICS FOR CHARGED PARTICLE IN A UNIFORM MAGNETIC FIELD. M. Carrassi. Nuovo cimento (10) 5, 955-60(1957) Apr.

The influence of a uniform magnetic field on the spin orientation of electrons in a beam is calculated according to the Dirac theory. It is shown that, when the field is perpendicular to the electron beam path, the spin orientation does not change with respect to the direction of propagation. The calculations are performed using the exact solution of Dirac equation. (auth)

8967

AN ANALYSIS OF THE PAIRS PRODUCED BY ^{8}Be γ-RAYS IN PHOTOGRAPHIC EMULSIONS. D. J. Prowse (Univ. of Bristol). Nuovo cimento (10) 5, 977-82(1957) Apr.

Electron-positron pairs produced in photographic emulsion by the γ rays emitted from the proton bombardment of lithium have been analyzed. The energy of the pair components has been measured by the multiple scattering technique and using the known values of 17.6 and 14.6 Mev for the γ-ray energies, scattering constants, applicable to the coordinate method, of $25.0^{+0.3}_{-1.0}$ and $22.7^{+0.3}_{-1.0}$ have been obtained for no cut off and for a $> \bar{\alpha}$ cut-off respectively. The projected angle of opening of the pairs has been measured and a correlation between angle of opening and disparity obtained which agrees fairly well with the theory of Stearns. (auth)

8968

SCATTERING OF FAST ELECTRONS BY POLARIZED NUCLEI. M. Bernardini, P. Brovetto, and S. Ferroni. Nuovo cimento (10) 5, 1292-1304(1957) May.

Detailed calculations are given of the cross section for fast electrons on polarized nuclei. The results are applied to the case of Ta^{181}; the predicted azimuthal anisotropy in the cross section varies from 130 to 50% according to the shape chosen for the distribution of nuclear charge. (auth)

GASES

8969 LA-2123

Los Alamos Scientific Lab., N. Mex.

THERMODYNAMIC AND TRANSPORT PROPERTIES OF DISSOCIATED HYDROGEN MIXTURES. Martin J. Reisfeld. Apr. 8, 1957. 22p. Contract W-7405-eng-36. $0.25(OTS).

Thermodynamic and transport properties for the system $H-H_2$ were calculated in the temperature range 1000 to 4000°K. Equilibrium composition and specific heat data are given as functions of temperature for a number of pressures ranging from 0.1 to 100 atm. The coefficients of viscosity and binary diffusion are also listed under these conditions. (auth)

8970

THE THERMO-OSMOSIS OF THE RARE GASES THROUGH

A RUBBER MEMBRANE. Richard J. Bearman (Stanford Univ., Calif.). J. Phys. Chem. 61, 708-13(1957) June.

A theory of thermo-osmosis based on the thermodynamics of irreversible processes is developed. Results on the thermo-osmosis through a rubber membrane of the rare gases (with the exception of radon) and of carbon dioxide are presented and then interpreted. A discussion of various sources of experimental error also is given. (auth)

8971

α-RAY INDUCED LUMINESCENCE OF GASES. L. O. Brown and N. Miller (Edinburgh Univ.). Trans. Faraday Soc. 53, 748-59(1957) June.

A study, using a photomultiplier tube, of the luminescence induced by a fixed source of Po^{210} in A, CO_2, and N_2, together with mixtures of these gases with quenching vapors, showed that the phenomenon was for the most part explicable on current ideas as to α-ray excitation and energy transfer by collision. In some cases energy transfer resulted in luminescence of the minor component where that of the major lay in the far u.-v. and was thus not detectable. It is suggested that an extension of these techniques using higher source strengths and improved resolution would prove useful in the study of the emission spectra of molecules. (auth)

INSTRUMENTS

8972 AECU-3491

Sandia Corp., Albuquerque, N. Mex.

TRANSISTORS AND CAPACITOR CHARGING. A. B. Church. Dec. 19, 1956. 11p. Contract [AT(29-1)-789]. (TM-271-56-14). $1.80(ph OTS); $1.80(mf OTS).

Equations to be used in the analysis of a "constant current" capacitor charging system are given. The circuit from which the equations are derived is simplified and consists of ideal components. At the outset it is stated that the circuit under investigation is the d-c equivalent of the master-oscillator power-amplifier transverter system similar to the XMC-868. (auth)

8973 USNRDL-TR-134

Naval Radiological Defense Lab., San Francisco.

A FEASIBILITY STUDY FOR THE DESIGN OF AUTOMATIC COUNTING AND SIZING INSTRUMENTATION. L. D. Miller. Nov. 16, 1956. 43p. Projects NS 081-001 and NE 051-500.

A feasibility study of automatic counting and sizing instruments was made, by making a literature survey of methods as well as an evaluation of instruments in production. An instrument using an intercept length comparison method appears to be the most advantageous one at the present time. It allows fast counting and sizing of irregularly shaped particles in the size range of ~0.5 to 3000 microns projected diameter. (auth)

8974 WADC-TR-54-409(Pt. I)

Oklahima Agricultural and Mechanical Coll. School of Engineering, Stillwater.

UNCONVENTIONAL ELECTRICAL POWER SOURCES. Attie L. Betts and Paul A. McCollum. Sept. 1954. 74p. Project title: ELECTRICAL GENERATION EQUIPMENT. Task title: STUDY AND RESEARCH PROGRAM ON UNCONVENTIONAL ELECTRICAL POWER SUPPLIES. Contract AF33(616)-2237. (AD-63967).

Information concerning the theoretical and practical limitations and capabilities of generating electrical power by means other than rotating machinery, conventional batteries, or radioactive devices is given. Data and theory are presented on Workman-Reynolds Effect, emission, pyroelectricity, thermopiles, thermomagnetic generators, ion exchange membranes, fuel cells, electrokinetic transducers, electrostatic devices, oscillating electromagnetic induction, piezoelectricity, magnetostriction, and photovoltaic generators. A major portion of the findings resulted from a library search. A limited amount of experimental and theoretical work was performed to verify and extend existing information. The thermoelectric effect, ion exchange membrane, oscillating electromagnetic induction, and fuel cells show promise of becoming valuable sources of electrical energy. The succeeding activity will be directed primarily toward extending available information on these power sources. (auth)

8975

AUTOMATIC PLOTTING DEVICE FOR RADIATION THERAPY APPLICABLE TO INSTRUMENTAL ANALYSIS. Ralph H. Müller. Anal. Chem. 29, No. 7, 51A-2A, 54A-5A (1957) July.

8976

MAGNETIC JACK. A NEW CONTROL DRIVE MECHANISM. Joseph N. Young (Argonne National Lab., Lemont, Ill.). Nucleonics 15, No. 6, 118-20, 122-3(1957) June.

An electromagnetic control-rod drive mechanism with magnetic gripping which operates satisfactorily in water-cooled reactors is described. (T.R.H.)

8977

HYDRODYNAMICS OF OSCILLATING DISKS IN VISCOUS FLUIDS: VISCOSITIES OF LIQUIDS He^3 AND He^4. R. Dean Taylor and J. G. Dash (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 106, 398-403(1957) May 1.

The viscosities of liquid He^4 from the lambda point to 4° K and of liquid He^3 near the critical point and from 1.3 to 2.15° K have been determined by the oscillating disk method. Detailed study of He^4 near the lambda point shows a discontinuity in the temperature derivative of the viscosity and provides additional evidence that the He I–He II transition is of the second order. Considerations based upon the temperature dependence of the He^4 viscosity above 2.5° K suggest that the zero-point kinetic energy plays an important role in determining the transport properties. The viscosity of liquid He^3 rises as the temperature decreases, from a value of 18.7 micropoise at 3.35° K to 26.8 micropoise at 1.3° K. A simple empirical equation describes the He^3 data over the entire temperature range. (auth)

8978

MILLIMICROSECOND TIME-TO-PULSE-HEIGHT CONVERTER USING AN rf VERNIER. R. L. Chase and W. A. Higinbotham (Brookhaven National Lab., Upton, N. Y.). Rev. Sci. Instr. 28, 448-51(1957) June.

A time-to-pulse height converter is described which uses an r-f vernier technique to facilitate the timing of an event with respect to the phase of a high-frequency clock. The event starts an oscillator whose frequency differs only slightly from that of the reference clock. The phase of the low-frequency beat note is used as an index of the phase of the clock at the time the event occurred. The system is particularly adaptable to studying fast neutron velocity distributions when the neutron pulses are produced at high repetition rates. It uses a minimum of fast circuit elements, is useful over almost the entire period between pulses at 20 Mc and higher, and gives unambiguous results. The performance with random pulses and with neutron groups has been studied with a 100-channel pulse-height analyzer. (auth)

8979

CONSTRUCTION OF THIN MYLAR GAS TARGET HOLDERS. J. C. Corelli, M. Livingston, and L. Seidlitz (Purdue Univ., Lafayette, Ind.). Rev. Sci. Instr. 28 471-2 (1957) June.

A technique for constructing gas target holders having Mylar windows 0.00035 in. thick is described. The curing

time is reduced to 5 to 10 min. and there is no possibility of the cement running onto the windows. (M.H.R.)

8980

CONVENIENT X-RAY TUBE MOUNT FOR TWO-CRYSTAL SPECTROMETER. F. W. Chambers and H. Cole (IBM Research Center, Poughkeepsie, N. Y.). Rev. Sci. Instr. 28, 465-6(1957) June.

This x-ray tube mount offers extreme flexibility in orienting the tube in space, combined with ruggedness and freedom from creep. The main feature of the spectrometer is that the x-ray tube may be locked to the first crystal and they both can be rotated together about the vertical pipe. (M.H.R.)

ISOTOPES

8981 ORNL-2289

Oak Ridge National Lab., Tenn.

PRODUCTION OF Xe^{131m_s}. R. E. McHenry. July 1, 1957. 3p. Contract W-7405-eng-26. $0.10(OTS).

A method and a device for preparing Xe^{131m_s} from NaI^{131} and purification of the product are described. (T.R.H.)

8982 USNRDL-456

Naval Radiological Defense Lab., San Francisco.

CALCULATED ACTIVITIES AND ABUNDANCES OF U^{235} FISSION PRODUCTS. R. C. Bolles and N. E. Ballou. Aug. 30, 1956. 260p.

This is a revised edition of ADC-65.

Computed disintegration rates and numbers of atoms (abundances) of each fission product radionuclide at various times after simultaneous slow neutron fission of 10,000 atoms of U^{235} are presented. These results are based on fission yields from two different theories of independent fission yields. The computations treat both known and unknown fission product radionuclides. Half lives and yields of the latter were estimated. The disintegration rate, the number of active and of inactive atoms, the total number of atoms, and the percentage contribution to total activity and to total number of atoms are presented for each element and for each chemical group of elements. The disintegration rate of the total fission product mixture according to each independent yield theory is also presented. (auth)

8983

SOME UPPER LIMITS OF ISOTOPIC ABUNDANCE. III. C, O, AND Zn. Larkin Kerwin, E. E. McElcheran, and Maurice Cottin (Univ. Laval, Quebec). Can. J. Phys. 35, 783-4(1957) June.

Some upper limits of abundance for isotopes of the elements carbon, oxygen, and zinc are given. (M.H.R.)

8984

ISOTOPE INDEX—THE COMPLETE PURCHASING GUIDE TO THE ISOTOPES. Indianapolis, Scientific Equipment Co., April 1957. 100p. $3.00.

8985

DIFFUSION OF O^{18} AND OF PROTIUM IN $D_2O - H_2O$ MIXTURES. Arthur W. Adamson and Riyard R. Irani (Univ. of Southern California, Los Angeles). J. Am. Chem. Soc. 79, 2967-8(1957) June 5.

In studies of diffusion in liquid systems at 25°C, it was found that O^{18} and protium evidently diffuse by different mechanisms. Plotting D_2O in H_2O vs. diffusion coefficient, the O^{18} diffusion coefficients varied as the inverse of the viscosity while protium showed a minimum at 50% D_2O. (T.R.H.)

ISOTOPE SEPARATION

8986 K-1330

Oak Ridge Gaseous Diffusion Plant, Tenn.

EQUILIBRIUM TIME FOR A SQUARE PLANT. D. W. Burton. June 12, 1957. 429p. Contract W-7405-eng-26. $1.75(OTS).

This report contains a table of equilibrium times for short square plants. This equilibrium time is defined by the relation, if τ is the equilibrium time, $[x(N,\tau)-x(0,\tau)]/[x(N,\infty)-x(0,\infty)] = 1-\epsilon$ where ϵ has the values 0.02, 0.01, 0.005. The numerator is the difference between the top stage concentration and the bottom stage concentration at time τ. The denominator is the same difference at steady-state. In the appendices the mathematical treatment is shown, and for the simple case of no top or bottom sampling drums, it is also shown that the equilibrium time derived by a linear problem differs slightly from the equilibrium time derived from a more exact equation. Thus the table can be used for the complete range of concentrations. (auth)

8987

U-235 BY CENTRIFUGING GETS NEW TRIAL. Chem. Eng. 64, No. 7, 144, 146(1957) July.

The separation of U isotopes by centrifuging is being investigated in Germany. Eight centrifuges have been built for separating $U^{235}F_6$ from $U^{238}F_6$. These machines have a diameter of 7.2 in. and are 47 in. high. They will rotate at a peripheral speed of about 6000 ft/sec., equivalent to about 32,000 rpm. The centrifugal force is about 100,000 times that of gravity. (W.L.H.)

8988

CONCENTRATION OF ISOTOPES BY ELECTROMIGRATION IN AQUEOUS SOLUTION: INFLUENCE OF TEMPERATURE ON RELATIVE MOBILITIES OF Na^{22+} AND Na^{24+} IONS. Andre Bonnin. Compt. rend. 244, 2708-10(1957) May 27. (In French)

The relative difference in mobility of Na^{22+} and Na^{24+} ions in aqueous solution was studied as a function of temperature by electromigration on filter paper. It increased with temperature, changing from 0.003 at 1°C to 0.008 at 49°C. (tr-auth)

8989

CONCENTRATION OF RUBIDIUM ISOTOPES BY ELECTROMIGRATION IN FUSED SODIUM NITRATE. Chawki Mangalo, Harirao Jeevan Arnikar, and Marius Chemla. Compt. rend. 244, 2796-8(1957) June 3. (In French)

The method of electromigration in asbestos impregnated with molten $NaNO_3$ was applied to Rb isotopes. The relative difference in mobilities of Rb^{85} and Rb^{87} has been found to be 0.00117. The mass effect measurement, $M\Delta v/v\Delta M$ = 0.05, is well below that obtained with Na and Li isotopes. (tr-auth)

MATHEMATICS

8990 AECU-3480

Sandia Corp., Albuquerque, N. Mex.

SUMMARY REPORT OF UNM STUDIES OF ACCURACY IN CALCULATING ARITHMETICAL PROBLEMS. P. F. Meigs. May 2, 1957. 13p. Contract AT(29-1)-789. (TM-114-57-12). $3.30(ph OTS); $2.40(mf OTS).

This report is a condensation of SC-3896(TR) and SC-4074(TR).

Procedures studied included use of worksheets of various forms, checking procedures, and correcting procedures. It was concluded that it is not possible to signifi-

cantly improve computational accuracy by the form of the worksheet. Where accuracy is critically important, independent checking of the computations by a second computer will achieve better than 90 per cent accuracy. In those situations where a second computer is not available, code checking procedures (casting out elevens) will achieve an accuracy ranging from 77% for free code checking to 87% for formal code checking. (auth)

8991 NP-6323
Kansas. Univ., Lawrence.
CONFERENCE ON PARTIAL DIFFERENTIAL EQUATIONS, UNIVERSITY OF KANSAS, SUMMER, 1954. Technical Report No. 14 [on] STUDIES ON EIGENVALUE PROBLEMS. 1955. 151p. Contract Nonr-58304.

Discussions are included on elliptic differential equations, boundary value problems, eigenfunction expansions, and asymptotic distribution of eigenvalues; initial value problems for non-linear hyperbolic equations; functional spaces, functional completion, and differential problems; boundary values of functions with a finite Dirichlet integral; coercive integro-differential quadratic forms; an isoperimetric inequality on surfaces of variable Gaussian curvature; closable hermitian forms and perturbation theory; spectral theory of functions on semigroups and the separation of variables; new bounds in harmonic and biharmonic problems; and results on the exterior integration formulas for the normal hyperbolic equation. (M.H.R.)

8992 ORNL-2334
Oak Ridge National Lab., Tenn.
STUDIES OF THE SPHERICAL HARMONICS METHOD IN NEUTRON TRANSPORT THEORY. I. THE RELATION BETWEEN P_L - AND GAUSS QUADRATURE SOLUTIONS OF THE MILNE'S PROBLEM. Walter Kofink. June 24, 1957. 58p. Contract W-7405-eng-26. $0.40(OTS).

Discussions are included on the P_L-approximation, scattering involving higher atomic angular momenta, the characteristic equation, a short comparison with the Gauss quadrature method, the investigation of $f^{II}(0,\mu)$, density and current, and the special cases of no absorption and isotropic scattering, absorption. Several complete calculations of functions are included in the appendices. (M.H.R.)

8993
PROGRAMMING A MONTE CARLO PROBLEM. J. F. Hall and J. M. Cook (Argonne National Lab., Lemont, Ill.). Proc. Second Annual Computer Applications Symposium 94-104(1955) Oct.

8994
NOTEBOOK OF THE MATHEMATICAL SCIENCES. VOLUME 134. THE METHODS OF VARIATIONAL APPROXIMATION IN THE THEORY OF ATOMIC COLLISIONS AND IN THE PHYSICS OF NUCLEAR PILES. T. Kahan, G. Rideau, and P. Roussopoulos. Paris, Gauthier-Villars, 1956. 87p.

The subject is divided into 5 parts entitled: The Problem of Collisions in Wave Mechanics; Variational Methods or Quantum Theory of Collisions—Variations on a Fundamental Theme; The Multiple Collision and Variational Methods—The Approximation of Percussion; Application of Variational Methods in the Theory of Diffusion of Waves and in the Theory of Collisions; Variational Methods in Reactor Physics. (T.R.H.)

MEASURING INSTRUMENTS AND TECHNIQUES

8995 AECD-4241
Union Carbide Nuclear Co. K-25 Plant, Oak Ridge, Tenn.
AUTOMATIC ISOTOPE MASS SPECTROMETER. Job Specification JS-741, Rev. 2. Sept. 16, 1955. Decl. with deletions Mar. 13, 1957. 57p. Contract [W-7405-eng-26]. (KD-664-2(Del.)). $10.80(ph OTS); $3.90(mf OTS).

The design of an automatic isotope mass spectrometer for installation within a process building where it will automatically withdraw samples from the process gas stream is given. It will analyze for the U^{235} content and record the results by each of two methods: either as mole ratio; or as an absolute value. (W.L.H.)

8996 CU-152
Columbia Univ., New York. Pupin Cyclotron Lab. and Columbia Univ., New York. Pegram Lab.
THIN PLASTIC SCINTILLATOR FISSION DETECTOR. V. K. Fischer, E. Nagel, and W. W. Havens, Jr. Nov. 20, 1956. 10p. Contract AT-30-1-GEN-72. $1.80(ph OTS); $1.80(mf OTS).

A fission fragment detector using a 0.002" thick plastic scintillator was constructed and tested. Pulses due to alpha particles from the fissionable material were eliminated by placing a biased diode at the output of the photomultiplier observing the scintillator. This allowed the electronics which followed the photomultiplier to be slow without resulting in pileup. The detector satisfied three requirements: low gamma ray sensitivity, stability, and fast pulse output. With a foil which had a total activity of about 10^4 α/sec, the ratio of the maximum pulse heights produced by 4.8 Mev α particles to those produced by the fission fragments was found to be 1:4.8, while the energy ratio was < 1:20. Thus although nonlinear, the detector would still be useful in many applications. An attempt was made to increase the area scanned by placing the photomultiplier at a distance from the plastic scintillator but the results obtained were not encouraging. (auth)

8997 HW-47194
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
LOGARITHMIC AND LINEAR SCINTILLATION EXPOSURE-RATE METERS WITH SODIUM IODIDE CRYSTALS. W. G. Spear. Apr. 1, 1957. 32p. Contract W-31-109-Eng-52. $0.25(OTS).

A NaI crystal of 1 mm thickness has been utilized in the development of a portable scintillation exposure-rate meter to produce a maximum sensitivity of 0.05 mr/hr full scale with a drift rate of less than 3% of full scale/hr. Two instruments employing the same detector were developed; one is a logarithmic instrument and the second has linear scales. Although the maximum sensitivity obtainable was found to be 0.05 mr/hr full scale, general survey usage at Hanford require 0.5 mr/hr as a maximum first range full scale sensitivity. Accordingly, the logarithmic instrument extends from less than 0.5 mr/hr through 5.0 R/hr, and the linear instrument employs scales in decades steps from 0 to 0.5 mr/hr to 0 to 5.0 R/hr full scale. Both instruments employ similar circuitry in general, and each weighs 5 lbs. (auth)

8998 K-1334
Oak Ridge Gaseous Diffusion Plant, Tenn.
SPECIAL APPLICATIONS LINE RECORDER MASS SPECTROMETER FOR ISOTOPE ANALYSIS. R. H. Stevens. June 21, 1957. 23p. Contract W-7405-eng-26. $0.25 (OTS).

A Special Applications Line Recorder Mass Spectrometer has been modified to determine isotopic abundance ratios for O_2, N_2, A and other elemental gases whose molecular weight is less than 50. A precision of ± 0.001 mol % for the lesser component was attained for periods in excess of one week for O_2, N_2, and A. Sample size was about 80 micron liters for non-corrosive gases (0.1 std. cc.). The installation included an automatic "range-change" preamplifier, a suppression panel which allowed observation of

mass signals to a precision of ± 1 part in 1000, and a special gas sample manifold which used a leak bypass valve for gas samples whose pressures were less than 500 microns. (auth)

8999 UCRL-3733

California. Univ., Berkeley. Radiation Lab.
COINCIDENCE NUCLEAR SPECTROMETRY WITH APPLICATIONS TO EUROPIUM-154 AND EUROPIUM-155 (thesis). Jose O. Juliano. Apr. 1957. 105p. Contract W-7405-eng-48. $16.80(ph OTS); $5.70(mf OTS).

An iron-free beta-ray spectrometer for electron-electron or electron-gamma coincidences using a time-to-height-converter as a coincidence unit was constructed, tested with Bi^{207} and Hg^{203}, and used in the study of the decay of Eu^{154}. From the conversion-electron and gamma-ray data a decay scheme is proposed for Eu^{154} and Eu^{155} Spins, parities, and quantum numbers of Nilsson's wave functions were assigned to the excited states whenever possible from the transition multipolarities. The relative intensities of the stronger conversion-electron lines of Th^{231} were determined with a thin-window magnetic spectrometer, and multipolarities were assigned based on the K-conversion coefficients of Sliv and the L and M subshell conversion coefficients of Rose et al. (auth)

9000 WADC-TR-57-3

Institute of Tech., Wright-Patterson AFB, Ohio.
ATTAINMENT OF NEUTRON FLUX-SPECTRA FROM FOIL ACTIVATIONS (thesis). Paul Michael Uthe, Jr. Mar. 1957. 91p. (GNE-9).

Several analytical methods are described for obtaining neutron flux-spectra knowledge from foil data. The response functions used are the nuclear reaction characteristics of threshold, fast fission, and resonance type foils. Two previously used methods and two new methods are discussed. The previously used methods are the Trice Method and the Cd Difference Method. The Trice Method, applicable in the fast neutron energy region, uses a "step function" cross section representation. The step function energy threshold is determined by assuming a differential flux function. The Cd Difference Method, applicable in the 1/E energy region, uses the resonance activation integrals of resonance type foils as cross section parameters. Although consideration is given to these methods, major interest is focused on two new methods, the Polygonal Method and the Polynomial Method. The Polygonal Method uses the cross sections in their true form and represents the flux-energy spectrum by a combination of linear functions of energy. In performing the necessary calculations, difficulty in selecting certain energy parameters is experienced. The Polynomial Method uses the cross sections in their true form and represents the flux-energy spectrum by a weighting function times a polynomial. The degree of the polynomial is one less than the number of different foils used. A digital computer is conveniently used for the required numerical calculations. The result of several test cases using the Polynomial Method indicates that considerable improvement over the Trice Method is achieved. (auth)

9001

THE MEASUREMENT OF BODY RADIOACTIVITY. PAPERS READ AT A CONFERENCE HELD AT LEEDS ON APRIL 16-17, 1956. C. B. Allsopp, ed. Brit. J. Radiol. Suppl. No. 7. 136p. $4.50.

Methods are discussed for the determination of natural radioactivity of the body, and for detecting the smallest possible increase caused from occupational or other causes. Topics discussed include the design and performance of high pressure ionization chambers; the design and performance of scintillation counters; the natural occurrence of radium in man, in waters, and in food; investigations of the radioactivity of radium workers; and application of excretion analyses to the determination of body burden of radioactive isotopes. Data are appended on the radiocesium content of contemporary man. (C.H.)

9002

CALORIMETRIC MEASUREMENTS ON SOURCES COMPOSED OF THE NATURALLY-OCCURRING RADIOACTIVE ELEMENTS. G. V. Gorshkov and N. S. Shimanskaya. J. Nuclear Energy 5, No. 1, 115-23(1957).

A calorimetric method is described for measuring the activity of preparations of elements from the naturally radioactive series. The relation between milligram-equivalent and millicuries has been determined for equilibrium sources of RaTh and Ac. The half life of Ra and the γ ray energies of Ra and Ac have been measured calorimetrically. (auth)

9003

A CALORIMETRIC DETERMINATION OF THE HALF-LIFE OF Ac^{227}. N. S. Shimanskaya and E. A. Yashugina. J. Nuclear Energy 5, No. 1, 161-2(1957).

The half life of Ac^{227} was found to be 21.2 ± 0.8 years by the calorimetric method. (M.H.R.)

9004

A LEAD FLUORIDE TOTAL-ABSORPTION SPECTROMETER FOR HIGH-ENERGY ELECTRONS AND PHOTONS. W. S. C. Williams and H. S. Caplan (The Univ., Glasgow). Nature 179, 1185-6(1957) June 8.

A total absorption spectrometer is described which employs a PbF_2 crystal as absorber. In PbF_2 there is no fluorescence, and all the emitted light is Cherenkov radiation. The number of photons emitted should be proportional to the fraction of the incident energy trapped. Lead glass is a better absorber at 50 to 300 Mev but PbF_2, having only $\frac{1}{3}$ the linear dimensions of Pb glass, would be more convenient at higher energies. The resolution should improve as energy increases. (T.R.H.)

9005

BF_3 NEUTRON SPARK COUNTER. Martin Jay Swetnick and Nicholas G. Anton (Anton Electronic Labs., Brooklyn, N. Y.). Nucleonics 15, No. 6, 93(1957) June.

A Rosenblum spark counter enclosed in a stainless steel cylinder filled with 96% B^{10} enriched BF_3 to 45 cm Hg achieved a slow-neutron detection efficiency of 0.6% and was completely insensitive to Co^{60} radiation at 500 r/hr. A paraffin moderator and Cd shield convert the assembly to a fast-neutron spark counter. (T.R.H.)

9006

OPERATING CHARACTERISTICS OF THE SPARK COUNTER. N. K. Saha and Narendra Nath (Univ. of Delhi, India). Nucleonics 15, No. 6, 94-7(1957) June.

Single and multiple-wire Rosenblum spark counters were developed and studied. The instruments, sensitive only to alpha particles, are described as to their counting and quiescent-current characteristics, number vs. distance curve for an alpha source, and observed temperature dependence. (T.R.H.)

9007

TRANSISTORIZED RADIATION SURVEY INSTRUMENTS. W. G. Spear (Hanford Atomic Products Operation, Richland, Wash.). Nucleonics 15, No. 6, 100, 102-3(1957) June.

An alpha scintillation meter, a G-M-tube meter, a combined alpha and G-M instrument, gamma and beta-gamma scintillation instruments, and a neutron-survey instrument are described. The power supply, amplifier and rate-meter circuits are all transistorized for light weight, compactness, and ease of maintenance of the 6 instruments. (T.R.H.)

9008

ASSAYING COMPOUNDS CONTAINING H^3 AND C^{14}. George T. Okita, Jon J. Kabara, Florence Richardson, and George V. LeRoy (Univ. of Chicago, Ill.). Nucleonics 15, No. 6, 111-14(1957) June.

A Tri-Carb liquid scintillation spectrometer with a 2-channel pulse-height analyzer was used to compare 3 methods for counting samples double labeled with H^3 and C^{14}. The discriminator-ratio method, with standard error of 3.7% for H^3 and 4.6% for C^{14}, proved more reliable than either the screening or simultaneous equation method. (T.R.H.)

9009

MASS MEASUREMENTS OF PARTICLES STOPPING IN THE EMULSION BY THE CONSTANT SAGITTA METHOD. B. Judek (National Research Council, Ottawa, Can.). Nuovo cimento (10) 5, 886-95(1957) Apr.

Scattering measurements by the Constant Sagitta method, using a scattering scheme based on the Göttingen tables, were made on tracks of particles stopping in the emulsion and at least 3 cm long. The following general results were obtained: The mean value of the sagitta, $\bar{D}$, for protons was found to be about 3% in excess of the theoretical value. The spread of the experimental observations of $\bar{D}$ corresponds quite closely to its expected statistical value calculated on the basis of the $75/\sqrt{N}$ % formula for the standard error. A good resolution for proton and deuteron groups was obtained on the basis of 3 cm and 2 cm track lengths. The range-energy exponent deduced from the observations on deuteron/proton and triton/proton mass ratios and from the variation of the value of $\bar{D}$ with residual range was found to be in good agreement with the value 0.568 of Fay et al. and Vigneron. No particle corresponding to a 1450 m_e meson suggested by Fowler and Perkins was observed, although the present statistics are not sufficient to exclude definitely the existence of such a particle. (auth)

9010

BUBBLE DENSITY ALONG THE PATH OF IONIZING PARTICLES CROSSING A BUBBLE CHAMBER. L. Bertanza, G. Martelli, and B. Tallini. Nuovo cimento (10) 5, 940-6 (1957) Apr.

The formation of bubbles along the path of charged particles in a bubble chamber is investigated, and the various processes which contribute to the formation of a track are analyzed. The dependence of the density of bubbles on the velocity of the particles and on the degree of superheat of the liquid is studied, and it is shown that the contradiction between some experimental results is only apparent and may be explained in terms of different conditions of operation. (auth)

9011

ON SOME ASPECTS OF PROCESSING THICK NUCLEAR EMULSIONS. E. J. Burge, J. H. Davies, I. J. van Heerden, and D. J. Prowse (Univ. of Bristol). Nuovo cimento (10) 5, 1005-8(1957) Apr.

Various precautions to prevent blistering in nuclear emulsions are suggested. Factors which affect the fixing process are discussed and some experimental data given. (M.H.R.)

9012

PHOTOGRAPHIC EVIDENCE FOR THE EXISTENCE OF THE NEUTRINO. J. Csikai (Nuclear Research Inst. of the Hungarian Academy of Sciences, Debrecen). Nuovo cimento (10) 5, 1011-12(1957) Apr.

The investigation of the β decay of He^6 by means of a hydrogen-filled cloud chamber demonstrated the missing impulse carried away by the neutrino. The photographic evidence is included. (M.H.R.)

9013

A TRIGGERED SPARK COUNTER. T. E. Cranshaw and J. F. deBeer (A.E.R.E., Harwell). Nuovo cimento (10) 5, 1107-17(1957) May.

The behavior of a triggered parallel plate spark counter has been investigated as a possible means of determining the trajectories of ionizing particles. Efficiencies, in an air-spaced counter, were 99%, with a rate of random breakdowns less than 1%. (auth)

9014

DETERMINATION OF DISTORTION VECTORS IN NUCLEAR EMULSIONS. Tsai-Chu. Nuovo cimento (10) 5, 1128-35(1957) May.

Distortion vectors were determined by multiple scattering measurements made on inclined tracks both in projection and in depth. Distortion vectors of different orders can be deduced from formulas expressed in terms of ordinate differences of multiple scattering. The magnitudes of distortion vectors determined are in good agreement with those obtained by other methods. (auth)

9015

APPLICATION OF THE KLAUSEN MICROMETER TO THE MEASUREMENTS OF MULTIPLE SCATTERING OF ELEMENTARY PARTICLES IN NUCLEAR EMULSIONS. G. Alvial and S. Stantic. Nuovo cimento (10) 5, 1333-4 (1957) May.

The performance of the Klausen micrometer is compared to that of the filar micrometer. The techniques used in the comparison are described. The advantages of the Klausen micrometer are listed. Among these are the same precision as the filar and that measurements may be made quicker with the Klausen. (M.H.R.)

9016

THALLIUM ACTIVATED CsI FOR SCINTILLATION SPECTROSCOPY. W. Beusch, H. Knoepfel, E. Loepfe, D. Maeder, and P. Stoll (Swiss Federal Inst. of Tech., Zürich). Nuovo cimento (10) 5, 1355-7(1957) May.

Thallium activated CsI crystals are compared with NaI crystals and found to be very suitable for γ spectroscopy, especially if high efficiency is needed. Results are tabulated. (M.H.R.)

9017

THE ABSORPTION OF SLOW NEGATIVE π-MESONS BY THE ELEMENTS IN NUCLEAR EMULSIONS. G. Brown and I. S. Hughes (The Univ., Glasgow). Phil Mag. (8) 2, 777-9(1957) June.

In order to separate the events in light and heavy nuclei, π mesons were passed into emulsions of different compositions. Stars induced by π-mesons stopping in the emulsions were subdivided according to the number of prongs. Results are compared with those of previous work. (M.H.R.)

9018

AN IMPROVED FLUOROMETER FOR MINIATURE GLASS ROD RADIATION DETECTORS. John Degelman, Arthur B. Callahan, and George P. Fulton (Boston Univ., Mass.). Radiation Research 6, 548-53(1957) May.

A new improved fluorometer has been designed and used for reading miniature silver-phosphate glass dosimeters (1 mm in diameter × 6 mm in length) which are implanted in living tissue for in vivo measurements of radiation dosage. (auth)

9019

LEAD GLASS CERENKOV RADIATION PHOTON SPECTROMETER. John M. Brabant, Burton J. Moyer, and Roger Wallace (Univ. of California, Berkeley). Rev. Sci. Instr. 28, 421-4(1957) June.

A spectrometer for analyzing photons of energies extending up to several Bev has been constructed and used

successfully. This instrument essentially consists of a cylinder of glass, 12-in. diam and 14-in. long containing 52% of PbO, viewed by four 5-in. diam photomultipliers. High-energy photons incident along the spectrometer axis produce electron showers in the transparent high-Z glass. The total Cherenkov radiation emitted by these electrons and detected by the phototubes is nearly proportional to the energy of the incident photon, from 50 Mev to at least 1.4 Bev. The spectrometer has been calibrated over this range of photon energies by the pulses produced by electrons of the same energies. Above 200 Mev the measured energy resolution of the spectrometer is 30% and is approximately independent of energy. For elimination of incident charged particles during the analysis of γ rays the spectrometer is operated in coincidence with a preceding photon-identifying counter system. (auth)

9020

MONOENERGETIC ABSORPTION PEAKS OBTAINED WITH A SCINTILLATION SPECTROMETER. J. Richard Haskins (Redstone Arsenal, Huntsville, Ala.). Rev. Sci. Instr. 28, 425-6(1957) June.

The effect of finite channel width in distorting intensities of monoenergetic lines in a scintillation spectrometer is considered. It is found that peak area divided by channel width gives the rate of monoenergetic absorptions in the crystal. A correction to intensities proportional to the square root of the pulse height is not applicable. (auth)

9021

REMARKS ON DOUBLE SOLUTE LIQUID SCINTILLATORS. P. Avivi and A. Weinreb (Hebrew Univ., Jerusalem, Israel). Rev. Sci. Instr. 28, 427-9(1957) June.

The behavior of wavelength shifters in liquid scintillators is discussed. The properties necessary in order that a fluorescent compound act as a wavelength shifter are considered in detail and a qualitative criterion for efficient wavelength shifting is presented. Several double solute solutions have been tested; accordingly it was found that the criterion is useful. (auth)

9022

RADIOCARBON DATING WITH LIQUID CO_2 AS DILUENT IN A SCINTILLATION SOLUTION. G. W. Barendsen (Yale Univ., New Haven, Conn.). Rev. Sci. Instr. 28, 430-2(1957) June.

The use of the scintillation technique for radiocarbon dating has until now been retarded by the difficulties encountered in the chemical procedure. This paper shows it to be feasible to use the CO_2 obtained by combustion of the sample, without any further chemical conversion, as a diluent in a scintillation solution. Up to 80% by weight and possibly more liquid CO_2 can be dissolved in toluene + 5 g/l diphenyl-oxazole (PPO). However, the presence of CO_2 in the scintillator interferes somewhat with the light emission in such a way that the decrease in pulse height, as compared with pure toluene + 5 g/l PPO, is 50% for 20% by weight dissolved CO_2. This limits the percentage of CO_2 that can be used effectively to about 30%. The counting rate due to modern carbon is 9.1 c/min, and the background is 15.5 c/min. Measurements indicate however that both these figures can be improved considerably, so as to make this technique at least comparable with the gas-counting technique. (auth)

9023

APPLICATION OF A PHOSWICH TO PARTICLE IDENTIFICATION. D. Bodansky and S. F. Eccles (Univ. of Washington, Seattle). Rev. Sci. Instr. 28, 464-5(1957) June.

A phoswich system used to perform a (dE/dx), E particle identification is described. The most serious limitation of such systems is a certain lack of flexibility, with the result that the fast phosphor must not be too thin. (M.H.R.)

9024

HIGH-PRESSURE EXPANSION-DIFFUSION CLOUD CHAMBER. Robert H. Good, Larry O. Oswald, and Wilson M. Powell (Univ. of California, Berkeley). Rev. Sci. Instr. 28, 472-3(1957) June.

The difficulties encountered in the operation of the ordinary diffusion or high-pressure expansion cloud chambers are overcome by attaching an expansion system to a diffusion chamber. A diagram of the present system and some specifications for it are included. (M.H.R.)

9025

ULTRASONIC DEGASSING OF LIQUID SCINTILLATORS. D. J. Cheleck and C. A. Ziegler (Tracerlab, Inc., Waltham, Mass.). Rev. Sci. Instr. 28, 566-7(1957) June.

An ultrasonic degassing technique for oxygen removal has been developed in which the scintillating solution is ultrasonically irradiated in an atmosphere of argon. The improvement in light output by this method was found to be equivalent to that obtained with a vacuum distillation method. Measurements taken on scintillating solutions incorporating C^{14}-labelled benzoic acid have indicated that degassing was obtained with no measurable loss of radioactivity. (M.H.R.)

9026

THE APPLICATION OF BREMSSTRAHLUNG IN THE INVESTIGATION OF THE DISTRIBUTION OF BETA RAYS IN THE HUMAN ORGANISMS. Hans Georg Mehl. Strahlentherapie 102, 569-74(1957) (In German)

MESONS

9027 NRL-4941

Naval Research Lab., Washington, D. C.

LECTURES ON THE DISPERSION RELATIONS IN MESON FIELD THEORY. R. L. Arnowitt. (Notes prepared by D. J. Kleitman). May 24, 1957. 83p.

Notes on a series of lectures on dispersion theory are given. The derivation of an adequate representation for the S matrix in meson–nucleon scattering and the definition of a retarded function M which is equal to the S matrix in the physical domain are included. The casualty condition is imposed. The dispersion relations are derived and an application is made to experimental data on pion-nucleon scattering. (M.H.R.)

9028 UCRL-3747

California Univ., Berkeley. Radiation Lab.

THE TOTAL CROSS SECTIONS FOR 190-Mev POSITIVELY CHARGED K MESONS IN COMPLEX NUCLEI (thesis). Leroy Thomas Kerth. Apr. 8, 1957. 40p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

The attenuation cross section and the differential scattering cross section in one angular interval were measured for K^+ mesons of 192-Mev kinetic energy. The targets were C, Al, Cu, Ag, and Pb. The cross sections were analyzed in terms of the optical model to determine the real and imaginary potentials. The average real potential was found to be consistent with a K^+-nucleon scattering cross section of about 10 mb. Some evidence was found for a variation of the mean free path in nuclear matter with Z. (auth)

9029

QUANTUM STATISTICS OF FIELDS AND MULTIPLE PRODUCTION OF MESONS. H. Ezawa, Y. Tomozawa, and H. Umezawa (Univ. of Tokyo, Japan). Nuovo cimento (10) 5, 810-41(1957) Apr.

Thermodynamical relations in quantum field theory are discussed which indicate whether or not interactions are renormalizable, i.e., of the first or second kind. The re-

normalization procedure is elucidated by formulating the perturbational calculation. The possibility for proceeding to the non-perturbational method is also pointed out. These general considerations are applied to determine the interaction effects in multiple production phenomena, which were disregarded in Fermi-Landau's statistical theory. (auth)

9030

THE LIFETIME OF POSITIVE HEAVY MESONS. B. Bhowmik, D. Evans, S. Nilsson, and D. J. Prowse (Univ. of Bristol), F. Anderson, D. Keefe, and A. Kennan (Univ. Coll., Dublin), N. N. Biswas, M. Ceccarelli, and P. Waloschek (Max-Planck-Institut fur Physik, Göttingen), J. E. Hooper, M. Grilli, and L. Guerriero. Nuovo cimento (10) 5, 994-1003(1957) Apr.

Over two hundred examples of the decay in flight of positive heavy mesons produced at the Bevatron have been observed in the photographic emulsions, and from these the lifetime of the particles has been estimated. The lifetime averaged over all modes of decay is found to be $1.35^{+0.16}_{-0.13}$ s. The effect of experimental biases is discussed, and the final result is compared with that of other authors. (auth)

9031

FURTHER EVIDENCE FOR A LONGLIVED NEUTRAL K-PARTICLE. S. V. Friesen and K. Kristiansson (Univ. of Lund, Sweden). Nuovo cimento (10) 5, 1013-15(1957) Apr.

An event, which can be explained by assuming a longlived neutral K particle, has been found in an emulsion exposed to K^+ particles produced by 6.2-Bev protons in a Cu target. Drawings of the event and discussion of possible explanations are included. (M.H.R.)

9032

K^- INTERACTIONS IN HYDROGEN. L. W. Alvarez, H. Bradner, P. Falk-Vairant, J. D. Gow, A. H. Rosenfeld, F. H. Solmitz, and R. D. Tripp (Univ. of California, Berkeley). Nuovo cimento (10) 5, 1026-46(1957) May.

K^--mesons from the Bevatron have been stopped in a 10-in. hydrogen bubble chamber. The first 137 interactions are reported. There are photographs confirming the existence of the $\overline{\theta^0}$ and the Σ^0, which must be lighter than the Σ^- by at least several Mev. Σ's are produced more profusely than Λ's in the absorption of K^- by protons: the production ratios $\Sigma^- : \Sigma^+ : \Sigma^0 : \Lambda \simeq 4 : 2 : 2 : 1$ are observed. The large observed absorption cross-section of slow K^- by protons suggests that the interaction takes place in p states as well as in s states. There is evidence that the spin of the Σ is greater than $\frac{1}{2}$. There is no evidence for parity doublets. Our data rule out the proposed selection rule $\Delta I = \pm \frac{1}{2}$. The accepted value for the mean life τ_Λ is checked, and we find $\tau_{\Sigma^-} = (1.83 \pm 0.26) \cdot 10^{-10}$ s and $\tau_{\Sigma^+} = (0.86 \pm 0.17) \cdot 10^{-10}$ s. (auth)

9033

EVIDENCE FOR A HEAVY NEUTRAL K-PARTICLE AND ITS CASCADE DECAY. M. S. Sinha and S. N. Sengupta (Bose Inst., Calcutta). Nuovo cimento (10) 5, 1153-8(1957) May.

Two cases of V^0-decays have been obtained in both of which one of the secondaries is found to be heavier than a pion and is found to decay into a thinly ionizing particle at the end of its range. Approximate momenta and ionization estimates lead to a low Q-value of about 10 Mev if the secondaries are taken to be a K and a π meson. These events therefore give evidence for the existence and cascade decay of a neutral heavy meson of mass near about 1270 m_e. This particle is believed to be a bound excited state of an ordinary K meson with a pion. (auth)

9034

POSSIBLE EXPLANATIONS OF THE DECAY PROCESSES OF THE PION IN THE FRAME OF THE "UNIVERSAL" FERMI INTERACTION. G. Morpurgo. Nuovo cimento (10) 5, 1159-65(1957) May.

Two possible independent ways of reconciling the observed rates of the pion decay processes with the predicted values which one obtains if the processes take place through the "Universal" Fermi Interaction are suggested; one depends on the freedom which we have in establishing the correspondence between PNeν and PN$\mu\nu$, the other on the modifications which the value of the ratio $|g_A|^2/|g_T|^2$ of the axial to the tensor coupling constant may suffer on account of the possible non invariance under time reversal of the β interaction. The predicted values for the ratios between the rates of the processes $\pi \rightarrow e + \nu$, $\pi \rightarrow e + \nu + \gamma$ and $\pi \rightarrow \mu + \nu$ are compatible with the present evidence. (auth)

9035

THE PRODUCTION OF HEAVY MESONS AND HYPERONS BY π^--MESONS OF 4.5 Gev/c. B. P. Edwards, A. Engler, M. W. Friedlander, and A. A. Kamal (Univ. of Bristol). Nuovo cimento (10) 5, 1188-96(1957) May.

A systematic investigation was carried out, using nuclear photographic emulsions, into the production of heavy unstable particles by π^--mesons of 4.5 Bev c. From 2,854 stars, 4 hyperons and 4 heavy mesons were found which had velocities of less than 0.7c, and which satisfied certain geometrical selection criteria. One hyperon produces a secondary π meson which comes to rest in the emulsion stack. The mass of this hyperon, shown to be negatively charged by the nuclear capture of its secondary particle, is $(2{,}352 \pm 5)\ m_e$. (auth)

9036

DETERMINATION OF THE PION-NUCLEON INTERACTION COUPLING CONSTANT FROM SCATTERING EXPERIMENTS USING DISPERSION RELATIONS. G. Puppi and A. Stanghellini. Nuovo cimento (10) 5, 1305-15(1957) May.

The renormalized coupling constant of the pion-nucleon interaction has been calculated by fitting the experimental data of the scattering with the dispersion relations. For the $\pi^+ + p \rightarrow \pi^+ + p$, $f^2 = 0.095 \pm 0.005$ and the experimental data and the theory have been found consistent. For the $\pi^- + p \rightarrow \pi^- + p$, a coupling constant appreciably smaller has been found. The fact is not understandable in the frame of the usual theory of the pion-nucleon interaction. (auth)

9037

ASSOCIATED PRODUCTION OF STRANGE PARTICLES. J. J. Sakurai (Cornell Univ., Ithaca, N. Y.). Nuovo cimento (10) 5, 1340-2(1957) May.

A simple field-theoretical explanation of results of previous work on the associated production of strange particles by π^- mesons on protons is given, under the assumptions that perturbation calculations are valid and that the spins of the K and the $\Lambda(\Sigma)$ are 0 and $\frac{1}{2}$ respectively. (M.H.R.)

9038

THE CAPTURE OF STOPPED NEGATIVE PIONS BY HYDROGEN. J. M. Cassels, G. Fidecaro, A. M. Wetherell, and J. R. Wormald (Univ. of Liverpool). Proc. Phys. Soc. (London) A70, 405-14(1957) June.

A total absorption Cherenkov γ-ray spectrometer has been used to study the relative probabilities of mesonic and radiative capture. The ratio was found to be 1.50 ± 0.15. This result is collated with other data concerning the interaction of low-energy pions with nucleons and radiation. Reasonable consistency is found. (auth)

9039

THE SCATTERING OF HIGH ENERGY μ-MESONS IN LEAD. J. L. Lloyd, E. Rössle, and A. W. Wolfendale (The

Univ., Manchester). Proc. Phys. Soc. (London) A70, 421-32(1957) June.

A study has been made of the scattering of μ mesons, in the momentum range 5 to 150 Bev/c, by a thick block of Pb. The experimental scattering distribution shows an excess of large displacements over the number expected on conventional scattering theory, indicating that the anomalous scattering found at low energies extends to these high energies. (auth)

9040

NOTE ON MODELS OF MULTIPLE MESON PRODUCTION AT EXTREMELY HIGH ENERGY. Ziro Koba (Kyoto Univ., Japan). Progr. Theoret. Phys. (Japan) 17, 288-302(1957) Feb.

Takagi's model and Heisenberg's model (modified with regard to the total cross section) for multiple meson production are examined, and they are found to conform to two sources of experimental information on the properties of secondary particles in jet showers: their composition and the distribution of their transverse momenta. The main aspects of these models, as well as those of the Landau model, are discussed. (auth)

9041

π MESONS. L. M. Barkov and B. I. Nikol'skii. (Review of Experimental Data.) Uspekhi Fiz. Nauk 61, 341-98(1957) Mar. (In Russian)

A systematic review is presented of basic experimental data on π-meson properties and interactions with nucleons and nuclei. Processes of multiple formation of π mesons, which play an important part in particle collisions at energies over 1000 Mev are discussed. 226 references. (R.V.J.)

METEOROLOGY

9042

THE INFLUENCE OF ATOMIC EXPLOSIONS ON METEOROLOGICAL PROCESSES. E. K. Fedorov. J. Nuclear Energy 5, No. 1, 135-45(1957).

The physical effects of atomic explosions on meteorological elements in the earth's atmosphere are considered. An analysis of the evidence shows that the thermodynamic effect of an explosion is insignificant, and cannot affect meteorological processes materially. Some changes of weather might result indirectly from a substantial modification of the electrical properties of the atmosphere and from the corresponding increase in condensation. To an order of magnitude, any such effects on the weather are comparable with those brought about by the periodic fluctuations in solar activity. (auth)

MOLECULAR PROPERTIES

9043

SELF-DIFFUSION IN GOLD. S. M. Makin, A. H. Rowe, and A. D. LeClaire (Atomic Energy Research Establishment, Harwell, Berks). Proc. Phys. Soc. (London) B70, 545-52(1957) June.

The self-diffusion coefficient D of 99.95% purity gold has been measured in the temperature range 704 to 1048°C using the sectioning method. D was found to vary with temperature according to the equation $D = (0.091 \pm 0.001)\exp[-(41700 \pm 300)/RT]cm^2sec^{-1}$. A detailed comparison of this result is made with those of earlier workers. (auth)

9044

IONIZATION BY POSITIVE IONS. H. B. Gilbody and J. B. Hasted (Univ. Coll., London). Proc. Roy. Soc. (London) A240, 382-95(1957) June.

A method is described of measuring the ionization cross section of atoms by positive ions, in which electrons are collected from single collisions of an ion beam passing through a gas at low pressures. Secondary electrons formed by the collisions of ions with surfaces are suppressed. Measurements are given for twenty-three cases, over energy ranges of ~5 to ~40 kev and ~100 to ~3 kev. The cross sections do not appear to conform to the simple adiabatic theory, but the size of cross section in the adiabatic region appears to depend upon the reduced mass of the system. (auth)

NEUTRONS

9045 HW-49188

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

THE AVERAGE ESCAPE PROBABILITIES FOR ONCE- AND MANY TIMES SCATTERED NEUTRONS FOR A SLAB. G. W. Anthony. Mar. 22, 1957. 31p. Contract W-31-109-Eng-52. $0.25(OTS).

The average reflection and transmission probabilities for neutrons having a single isotropic scattering collision in a slab of finite thickness is found for the general case of a $\cos^k$ entrant angular distribution. Extensive tables are presented of functions which arise in the determination of these probabilities. The average non-escape probability for neutrons which have reached a limiting distribution as a result of many scattering collisions is considered. An expression for the capture fraction of a slab for $\cos^k$ entrant neutrons valid over a large range of slab thicknesses and scattering to total cross section ratios is presented. (auth)

9046 SWP/P-28

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE ATTENUATION OF THERMAL NEUTRONS IN CYLINDRICAL DUCTS THROUGH A WATER SHIELD. C. C. Horton and D. B. Halliday. Jan. 1956. 12p.

The attenuation of thermal neutrons in air filled cylindrical ducts in a water shield has been studied. The ducts varied in length up to 56 radii, and were bent through angles varying from 10° up to 90°. It is found that the attenuation in a duct at a distance of Z radii after a bend of $\theta°$ is given by $\phi/\phi_0 = (\gamma/\sin\theta)(1/z)^2(1 + \delta/z)$ for $3 < z < 30$ and $10° < \theta < 90°$. ϕ/ϕ_0 is the ratio of flux to flux at the bend, and γ,δ are functions of the albedo of the shield material only. (auth)

9047

NEUTRON SPECTRUM OF AN ACTINIUM–BERYLLIUM SOURCE. W. R. Dixon, Alice Bielesch, and K. W. Geiger (National Research Council, Ottawa). Can. J. Phys. 35, 699-702(1957) June.

The neutron spectrum of an Ac^{227}-α-Be source has been determined from proton recoil tracks in nuclear emulsions, and found to be in general agreement with the spectra of Po-α-Be and Ra-α-Be sources. Direct observation is limited to neutron energies above about 0.5 Mev. The question of neutrons below this energy is also considered. (auth)

9048

TOTAL CROSS SECTIONS σ_t FOR E = 14.8 MEV NEUTRONS MEASURED BY COUNTING (n,α) COINCIDENCES. M. M. Khaletskiĭ (Inst. of Chemical Physics, Acad. of Sciences U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 113, 305-6(1957) Mar. 11. (In Russian)

A monochromatic neutron beam isolated from the $D^2(t,n)He^4$ reaction and correlated with the α particles was used for measuring σ_t cross sections without the interference of other neutrons. Measurements were made using

a thick T–Zr target with the incident beam of magnetically isolated 160-kev deuterons. The α particles, emerging from the target were recorded by a NaI crystal 0.5 mm thick. A diagram is given of the count of coincidences showing the direction of the neutron beam correlated with the α particles. The neutron counter placed in a radius of 25 cm from the target was rotated around the target at φ angle (in the horizontal plane) and at θ angle (in the vertical plane), the (n,α) coincidences for each n-counter position were taken with the same count of α particles and the total σ_t cross sections were measured considering (n,α) coincidences with scattering and without. The results of σ_t measurements are tabulated. (R.V.J.)

9049

NEUTRON FLUX WITHIN CYLINDRICAL AIR GAPS. S. P. Levy de Bollini and C. G. Bollini. J. Nuclear Energy 5, No. 1, 33-40(1957).

A method, which allows the calculation of the neutron-flux distribution at the interior of air gaps of any geometry, is applied. From the values of the vectorial flux at the surface, and from the form of this surface, the neutron flux at any interior point of the gap can be evaluated. The diffusion theory gives the values of the flux and its normal derivative at any point of the surface. Those values are all that is needed for the determination of the vectorial flux (in this approximation). In the case of two concentric infinite cylinders (the interior one being a black rod), a remarkable result was found: the flux shows a maximum inside the gap. The physical significance of this effect is explained. (auth)

9050

ON THE PRINCIPLE OF INVARIANT IMBEDDING AND ONE-DIMENSIONAL NEUTRON MULTIPLICATION. Richard Bellman, Robert Kalaba, and G. Milton Wing (Rand Corp., Santa Monica, Calif. and Los Alamos Scientific Lab., N. Mex.). Proc. Natl. Acad. Sci. U. S. 43, 517-20(1957) June.

A new method of treating problems involving neutron multiplication by fission is introduced, with special regard to questions of critical mass and distribution of neutrons. The results are derived from applications of the principle of invariant imbedding. (M.H.R.)

NUCLEAR PHYSICS

9051 CRP-615

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

COEFFICIENTS FOR TRIPLE ANGULAR CORRELATION ANALYSIS IN NUCLEAR BOMBARDMENT EXPERIMENTS. A. J. Ferguson and A. R. Rutledge. Feb. 1957. 486p. (AECL-420).

The angular correlation between an incoming particle and two successive outgoing radiations can be expressed in terms of orthogonal functions of the three free angles. The coefficients of this expansion will be functions of quantized variables, such as spins and orbital momenta, and of continuous variables, such as matrix elements describing orbital and multipole mixtures. These coefficients are presented for the case of a captured incoming particle followed by two outgoing gamma rays in cascade. The coefficients greatly facilitate the computation of the theoretical results to compare with specific correlation experiments. The amount of information available from a triple correlation experiment is quite large. The case of non-interfering states the only one given, and here the unknowns will generally be over-determined. (auth)

9052 IDO-16331

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

MTR TECHNICAL BRANCH QUARTERLY REPORT, FOURTH QUARTER 1956. H. L. McMurry, ed. Mar. 26, 1957. 51p. Contract AT(10-1)-205. $0.35(OTS).

Estimates were made of flux perturbation expected from insertion of a Cd liner in the HB-5 hole and a Cd box in HG-9 hole. The origin of anomalous heat fluxes deduced from data in film boiling experiments was sought by studying the thermal properties of the media, analyzing the fuel plate core, and studying thermocouple stability. Hydraulic testing of MTR fuel assemblies was started. Studies were made of $In_2(SO_4)_3$ activation in the MTR and flux distributions near an $In_2(SO_4)_3$ container in the RMF. Calculations on a cylindrical model of the ETR indicate that the removal of moderator from a local interior region will not cause a serious increase in reactivity. A method was developed for estimating the charge life of the ETR from a knowledge of the flux and adjoint functions at the start of a cycle. Construction was started on the ETR critical facility. Calculations indicate the use of BeO instead of Be in the reflector will not significantly effect the flux distribution and criticality. The RMF was equipped with an oscillator for measuring pile cross sections. A linear relation was shown to exist between the reactivity effects of irradiated Th and its U^{233} content. Initial studies were made to determine the upper limit of obtainable flux in an MTR-type reactor. The effects of experimental facility size and fuel concentration on operating power levels were plotted. A value of 2600 barns was found for the capture cross section of Ir^{192}. Seventeen gammas were detected in decay studies of 14.5-d Bi^{206}. (For preceding period see IDO-16314.) (D.E.B.)

9053 NP-6317

Collège de France, Paris.

ÉTAT ACTUEL DES RECHERCHES SUR LE NEUTRINO. (Present State of Research on the Neutrino). Maurice E. Nahmias. Nov. 22, 1955. 20p.

A review of research on the neutrino is presented. Instances of verification of the neutrino are listed and other information is grouped under the topics: Interaction of Neutrinos with Electrons; The Mass of the Neutrino; The Magnetic Moment of the Neutrino and its Ionization Capacity; Interaction of Neutrinos with Nuclei; Neutrinos and Anti-Neutrinos, Double β Decay; and β Inverse Processes. (T.R.H.)

9054 PR-P-33

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

PHYSICS DIVISION PROGRESS REPORT [FOR] JANUARY 1, 1957 TO MARCH 31, 1957. 93p. (AECL-448).

A combination Geiger and scintillation apparatus for use in cosmic ray meson experiments is described. Revisions in the semi-empirical atomic mass formula are discussed and preliminary results from studies of fission reactions are given. Results are reported from decay studies of Tb^{160}, Eu^{154}, Eu^{156}, Pr^{144}, and Y^{90}. The use of a circular polarization analyzer in parity conversion experiments is reviewed. Velocity measurements on coincident pairs of fragments from Cf^{252} spontaneous fission were completed and are reported. Experiments with the $Al^{27}(p,\gamma)Si^{28}$ reaction gave evidence of a 4.64 Mev level in Si^{28} which cascades to the ground state via a cross-over transition at 1.77 Mev. Quantitative data were obtained for the first nine excited states of B^{11} observed in the reaction $Be^{9}(He^{3},p\gamma)B^{11}$. Some of the characteristics of excited states observed in $Al^{27}(p,p'\gamma)$ and $B^{10}(He^{3},p)C^{12}$ reactions

are discussed. Results obtained in neutron diffraction studies of Mn–Co alloy, UO_2, solid Ne and He, and UMn_2, UFe_2 and UCo_2 alloys are discussed. Progress in the development of various radiation detection instruments is reviewed. (For preceding period see PR-P-32.) (D.E.B.)

9055 AEC-tr-2933

DEMONSTRATION OF A NUCLEAR CHAIN REACTION INSIDE URANIFEROUS MASS. H. Halban, Jr., F. Joliot, L. Kowarski, and F. Perrin. Translated from J. phys. radium 10, 428-9(1939). 5p.

Experiments are described which give the number of neutrons produced in a sphere or humid uranium oxide 50 cm. in diameter irradiated by a source of primary photoneutrons. A discussion of the value of this number allows the conclusion that the produced neutrons are of secondary, tertiary, etc. origin, demonstrating in the system used the production of a convergent chain reaction. (auth)

9056

NUCLEAR MAGNETIC RESONANCE EXPERIMENT ON METAL CADMIUM. Yoshika Masuda (Kobe Univ.). J. Phys. Soc. Japan 12, 523-8(1957) May.

The Knight shift, the line width and shape, and the spin-lattice relaxation time of the resonance line in metal Cd are measured employing a nuclear magnetic resonance technique. The resonance line is asymmetric indicating an anisotropy of the Knight shift. From the analysis of these line shapes, the asymmetry in p-character of the conduction electron is estimated. The shift perpendicular to the c-axis is 0.42% and the shift parallel to the c-axis is 0.46%. The isotropic shift is 0.43%. In appendix, skin effect in metallic foil is discussed. (auth)

9057

A CLASSICAL CALCULATION OF THE NUCLEON-MESON COUPLING CONSTANT. G. Stephenson (Imperial Coll., London). Nuovo cimento (10) 5, 1009-10(1957) Apr.

9058

THE ANNIHILATION OF A NUCLEON-ANTINUCLEON SYSTEM INTO A K-ANTI K PAIR. R. Gatto. Nuovo cimento (10) 5, 1024-5(1957) May.

The selection rules are derived for the annihilation of a nucleon-antinucleon system into a K-anti K pair. The selection rules follow from conservation of angular momentum, of parity, of the charge conjugation quantum number, and from charge symmetry. Moreover it is shown that, if the Lee-Yang parity doublets theory holds, other selection rules can be derived from the conservation of two new quantum numbers, E and F. (auth)

9059

CHARACTERISTICS OF THE NUCLEAR DISINTEGRATIONS PRODUCED BY PROTONS OF 140 ± 6 Mev. III. LIGHT NUCLEI. S. Jannelli and F. Mezzanares. Nuovo cimento (10) 5, 1047-56(1957) May. (In Italian)

9060

D WAVE EFFECTS IN POSITIVE PION-PROTON SCATTERING. E. Clementel and C. Villi. Nuovo cimento (10) 5, 1343-8(1957) May.

The data of A. I. Mukhin et al. were used to investigate the interactions of positive pions with protons at 270 and 307 Mev. The results of this analysis are different from those of the Russian authors, because among the four causal solutions, existing when D waves are considered, there are two, and not only one, which involve the Fermi set of P phase shifts. Furthermore, the linearity of α_3 versus the relative momentum η has not been found consistent with the best fit of the 307 Mev data. (auth)

9061

ON THE NUCLEONS MAGNETIC MOMENTS CONTRIBUTION TO THE RADIATIVE PION-NUCLEON SCATTERING. B. Bosco (CERN, Geneva). Nuovo cimento (10) 5, 1361-3 (1957) May.

The cut-off form of the Yukawa theory is applied to the radiative pion-nucleon scattering. The treatment of the nuclear current part of the γ-ray spectrum is outlined. It is concluded that the contribution of the nucleons magnetic moment to the radiative scattering is very small and that significant contributions to the complete spectrum only can derive from interference terms. (M.H.R.)

9062

THE PARITY NON-CONSERVATION AND THE STRENGTH OF THE INTERACTION OF ELEMENTARY PARTICLES. S. Tanaka (Rikkyo Univ., Tokyo). Nuovo cimento (10) 5, 1364-7(1957) May.

The results of an attempt to get a theoretical inner relation which may exist among the kinds of particles, the strength of couplings, and the violation of the parity conservation, etc., introducing the internal degrees of freedom, are given. (M.H.R.)

9063

ON THE SOLUTIONS OF THE FLUCTUATION PROBLEM IN CASCADE SHOWERS. J. W. Gardner (English Electric Co., Whetstone, Leicester, Eng.). Nuovo cimento (10) 5, 1368(1957) May.

A practical method of obtaining numerical results in special cases for the longitudinal number distribution function in shower theory is discussed. (M.H.R.)

9064

ANGULAR CORRELATION OF RADIATIONS WITH PARALLEL ANGULAR MOMENTA. U. Fano. Nuovo cimento (10) 5, 1358-60(1957) May.

The theory of angular correlation and distribution of radiation simplifies considerably in a chain of emission processes with parallel angular momenta. This simplification is expressed as a theorem stated in terms of the vector model. The calculation of a β-γ correlation is outlined as an application. (M.H.R.)

9065

THE SCATTERING OF POSITIVE IONS BY NEUTRAL ATOMS. D. W. Sida (Univ. Coll., London). Phil. Mag. (8) 2, 761-71(1957) June.

The interaction between a positive ion and a neutral atom is calculated from a statistical model which treats the electrons as a Fermi gas and considers the electrostatic forces between it and the nuclei, as well as the kinetic and exchange energies of the gas itself. This is applied to the case of Ca^{++} ions and Ne atoms and of K^+ ions and A atoms. The former is extended to consider also neutral Ca atoms and Ne atoms. The elastic scattering of these ions is calculated by the classical and also by the quantum method over an energy range up to about 15 kev using these interactions. The results have been applied to problems of meteor trails and the spread of a beam of ions due to multiple scattering. (auth)

9066

NUCLEAR MOMENTS OF INERTIA. T. H. R. Skyrme (Atomic Energy Research Establishment, Harwell, Berks). Proc. Phys. Soc. (London) A70, 433-44(1957) June.

A formula proposed by the author for the calculation of the moment of inertia of a nuclear system is discussed. A simple calculation using the model of a deformed oscillator well for the mean nuclear potential gives the result $M\Sigma z^2$ for a prolate distribution, approximately half the rigid moment; it is suggested that this result incorporates most of the effects of the residual interactions between nucleons.

The problem of other potential shapes and the velocity-dependence of the potential is discussed qualitatively. (auth)

9067

ENCYCLOPEDIA OF PHYSICS. VOLUME 40. NUCLEAR REACTIONS I. (HANDBUCH DER PHYSIK. BAND XL. KERNREAKTIONEN I). S. Flugge. Berlin, Springer-Verlag, 1957. 558p. (In English)

NUCLEAR PROPERTIES

9068 CU-160

Columbia Univ., New York. Pupin Cyclotron Lab. and Columbia Univ., New York. Pegram Lab.

THE 2200 M/SEC. NEUTRON ABSORPTION CROSS SECTION OF BORON. W. W. Havens, Jr., E. Melkonian, and B. M. Rustad. May 3, 1957. 16p. Contract AT-30-1-GEN-72. (TNCC(US)-25). $3.30(ph OTS); $2.40(mf OTS).

The neutron absorption cross section of California B was determined by transmission measurements on Corning B glass using a crystal spectrometer at the BNL reactor and a neutron time of flight spectrometer with the Columbia University 37″ cyclotron. The result is $\sigma_{B\ abs} = 756 \pm 6$ at 2200 m/sec. where ± 6 represents the outside limits of error. (auth)

9069 UCRL-3688

California. Univ., Berkeley. Radiation Lab.

SCATTERING OF GAMMA RAYS BY PROTONS BELOW NEUTRAL MESON THRESHOLD (thesis). Larry L. Higgins. Feb. 14, 1957. 88p. Contract W-7405-eng-48. $13.80(ph OTS); $4.80(mf OTS).

The differential cross section for the elastic scattering of gamma rays by protons at 90° has been measured in the bremsstrahlung beam at the Berkeley synchrotron. The measurements were carried out below the threshold energy for neutral meson production, in the energy region from 40 to 132 Mev. The gamma rays scattered from a liquid hydrogen target are detected by a converter telescope and recorded photographically. The recoil proton is not detected. The energy dependence of the cross section is obtained by the photon-difference method. The cross section is found to be an increasing function of photon energy, and indicates that the scattering due to the anomalous magnetic moment of the proton and its interference with the mesonic polarization scattering are necessary additions to the proton Klein-Nishina cross section. The absolute differential cross section at 90° in the low-energy region of this experiment was found to be approximately 30% higher than the Thomson cross section. (auth)

9070

SOME OBSERVATIONS ON PROTON MAGNETIC RESONANCE IN HYDROGEN-BOMBED SYSTEMS. B. N. Bhar. Arkiv Fysik 12, No. 2, 171-203(1957).

Several nuclear magnetic resonance (n.m.r.) experiments are described concerned with the chemical shift of the resonance line of the protons in hydrogen-bonded systems. Discussions are included on the reaction between methyl alcohol and acetic anhydride, the effect of temperature and molecular-complex-forming solvent on hydrolysis of acetic anhydride, the possible effect of a magnetic field on chemical reactions, proton chemical shift in acetic acid-heavy water system, H-bond in formic acid, in acetylacetone, and in methyl alcohol, proton resonance in propionic acid, and unimolecular transformation in acetylacetone. (M.H.R.)

9071

ON THE COLLECTIVE ASPECT OF THE FIRST O^+ LEVEL OF THE O^{16} NUCLEUS. Jean Touchard. Compt. rend. 244, 2499-2502(1957) May 13. (In French)

From compression–dilatation oscillations, using the method of forced potentials, the primary excited O^+ state of the O^{16} nucleus is explained. (tr auth)

9072

CHAIN REACTIONS BY FAST NEUTRONS IN ENRICHED URANIUM. Marc Feix, Paul Nicourd, and Simone Valentin. Comp. rend. 244, 2502-5(1957) May 13. (In French)

The almost complete knowledge of the nuclear constants for U with fast neutrons permits the determination of Laplacians and the reactivity in infinite media. The integral equation giving these quantities is solved by stratifying the energy of the neutrons in 24 groups, which reduces the problem to calculation of the proper matrix values. (tr-auth)

9073

EFFECT OF NEUTRON INTERACTION ON CRITICALITY. II. G. W. Stuart (General Electric Co., Richland, Wash.). J. Appl. Phys. 28, 677-9(1957) June.

A method for calculating the criticality conditions for spatially disconnected fissile regions based on the multiplication constant k is presented. To illustrate the method, the case of two interacting infinite water-tamped fissile slabs containing solutions of pure U^{235} in water is considered. (auth)

9074

THE ALPHA HALF-LIFE OF AMERICIUM-241. G. R. Hall and T. L. Markin (Atomic Energy Research Establishment, Harwell, Berks). J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 137-42(1957).

The preparation of AmO_2, $Am_2(SO_4)_3$, and anhydrous $AmCl_3$ is described. These compounds have been used in the determination of the alpha half life of Am^{241}. A value of $7.187 \pm 0.007 \times 10^6$ α/min/μg was obtained for the specific activity, from which the half-life is calculated to be 458.1 ± 0.5 years. (auth)

9075

HALF-LIFE OF Pu^{236}. Darlene C. Hoffman, George P. Ford, and Francine O. Lawrence (Los Alamos Scientific Lab., N. Mex.). J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 143-5(1957).

The half-life of the alpha emitter, Pu^{236}, was measured by a direct decay method. Corrections were applied for the alpha-emitting daughters of Pu^{236}. The results of three sets of data were: 2.855 yr, s = 0.009 yr; 2.817 yr, s = 0.04 yr; 2.836 yr, s = 0.021 yr. The weighted average is 2.851 yr with s = 0.008 yr. (auth)

9076

THE ADDITION PRODUCTS OF HEAVY-ION BOMBARDMENT OF TANTALUM. K. F. Chackett and G. A. Chackett (Univ. of Birmingham, Eng.). J. Inorg. and Nuclear Chem. 4, No. 3 and 4, 225-9(1957).

An investigation has been made of the products obtained by bombarding Ta with ions of C^{12}, C^{13}, and N^{14}. Mercury, Au, and Pt activities in the 187-, 188-, and 189-mass chains were looked for. Evidence is presented that a previously observed 4.5-min activity in Au may be assigned to Au^{188}. An accurate value for the half-life of Hg^{189}, viz. 23 ± 2 min, was obtained by a milking experiment. (auth)

9077

THE ABSORPTION CROSS-SECTION OF THE HARWELL BORON STANDARD FOR NEUTRONS OF 2200 M/SEC. P. A. Egelstaff (Atomic Energy Research Establishment, Harwell, Berks). J. Nuclear Energy 5, No. 1, 41-9(1957).

Several measurements of the absorption cross section of B for neutrons of 2200 m/sec, using the Harwell slow chopper, are described. The result obtained for the B in the Harwell boric-acid standard is 771 ± 5 b. This measurement is compared with other recent determinations and with data obtained from the ratio of B-to-Au cross sections.

Some inconsistencies in these data are noted. The most probable values of the absorption cross sections at 2200 m/sec are derived from all the data taken together. These values are: for B in the Harwell boric-acid standard, 769 b, for Au, 98.5 b. (auth)

9078

THE TOTAL NEUTRON CROSS-SECTIONS OF Pd, Os, Ir, Mo, In, I, Ta, Th, AND U^{238} IN THE RESONANCE REGION. I. A. Radkevich. V. V. Vladimirsky, and V. V. Sokolovsky. J. Nuclear Energy 5, No. 1, 92-107(1957).

Level parameters are given, calculated from previously published cross-section curves and from new measurements on Ir, Th, and U^{238} described herein. The measurements were made over the range 4·5 to 10,000 ev with a mechanical velocity selector of resolution 0·08 μsec $meter^{-1}$. Curves are plotted showing the distributions of neutron widths. (auth)

9079

ELECTRON SCATTERING IN NUCLEAR FIELD WITH PAIR-CREATION. E. Montaldi and M. Pusterla. Nuovo cimento (10) 5, 961-72(1957) Apr.

By Feynman's graphs, the differential cross section is computed and the line of calculation of the total cross section is indicated for the process of electron scattering in nuclear fields with pair creation. (auth)

9080

ON THE 7.7 Mev LEVEL OF CARBON 12. A. Hossain and D. J. Prowse (Univ. of Bristol). Nuovo cimento (10) 5, 973-6(1957) Apr.

The analysis of the α-particle spectrum from the reaction $N^{14}(d,\alpha)C^{12}$ at a bombarding energy of 20 Mev and of the inelastically scattered proton spectrum from C^{12} at an energy of 9.5 Mev has revealed the presence of the 7.7 Mev level in C^{12}. Approximate values are given for the cross sections leading to the formation of this level in both reactions. (auth)

9081

ON NEUTRON-PROTON SCATTERING. E. Clementel and C. Villi. Nuovo cimento (10) 5, 1166-87(1957) May.

General expressions for the nucleon-nucleon elastic scattering cross-section and polarization are derived from the transition matrix up to the orbital angular momentum $L = 3$. A detailed investigation on the reliability of the approximation restricted to partial waves corresponding to $L \leq 2$ has been carried out. The charge independence of nuclear forces and the continuity of the phaseshifts versus neutron energy has been taken into account. It is shown that because of the change of sign of the singlet S phaseshift at about 220 Mev, following from the analysis of proton-proton data, the n-p differential cross-section at 260 Mev cannot be fitted in the lowest approximation without destroying either the continuity of the phaseshift solutions in the energy interval ranging from 27 to 260 Mev or the charge independence of nuclear forces, or both. It is also shown that the high energy n-p solutions cannot be continuously linked to the low energy ones if the S phaseshift for the singlet state is assumed positive throughout the considered energy interval. The effect of the $^3S_1$-$^3D_1$ coupling is discussed in detail at 95 Mev. (auth)

9082

ELECTROMAGNETIC PROPERTIES OF PARTICLES WITH SPIN. V. Glaser and B. Jakšić. Nuovo cimento (10) 5, 1197-1202(1957) May.

The scattering of a relativistic electron on particles with some electromagnetic structure and spin up to $s = 3/2$ is investigated, and the cross sections, in the first Born approximation for the electromagnetic field, are calculated. A possible estimation of the proton radius is given on the basis of quite general arguments. (auth)

9083

EFFECTS OF PROTON CORRELATIONS ON THE SCATTERING OF HIGH-ENERGY ELECTRONS FROM NUCLEI. L. I. Schiff. Nuovo cimento (10) 5, 1223-37(1957) May.

The extent to which the correlations between protons in nuclear matter manifest themselves in the scattering of high-energy electrons from nuclei was investigated. The infinite-order Born series is summed, so that dispersion effects that arise from excitation of virtual intermediate nuclear states are included to all orders. Use is made of a high-energy approximation developed earlier, and of the static or adiabatic approximation for the nuclear protons, and these are justified for incident electrons; their validity for nucleon scattering is also discussed. Expressions for the large-angle elastic and inelastic differential scattering cross-sections are obtained in this way. It is then shown that correlation effects are difficult to identify so long as the final nuclear state is well-defined. On the other hand, if a sum over final states is carried out, the effects of short-range correlations between protons appear in a characteristic way in the summed differential cross-section. These results are in qualitative agreement with those obtained earlier by others on the basis of the first and second Born approximation. (auth)

9084

THE MASS OF THE NEUTRINO AND THE NON-CONSERVATION OF PARITY. B. F. Touschek. Nuovo cimento (10) 5, 1281-91(1957) May.

A special form of the theory of Lee and Yang [Phys. Rev. 104, 256(1956)] is obtained by imposing an invariance principle, which insures that the mass as well as the magnetic moment of the neutrino is identically zero. This invariance property leads to the conservation of a quantum number n. The non-conservation of parity is discussed for the chain of decays $\pi \rightarrow \mu + \nu$, $\mu \rightarrow e + \bar{\nu} + \nu$. It is shown that the present theory contains as a special case the "screwon" theory recently proposed by Lee and Yang and a similar theory proposed by Salam [Nuovo cimento 5, 754(1957)]. (auth)

9085

ANGULAR DISTRIBUTION OF PHOTOPROTONS FROM OXYGEN. C. Milone and R. Ricamo. Nuovo cimento (10) 5, 1338-9(1957) May.

Normal Ilford C2 nuclear plates as well as water loaded plates have been exposed to γ rays. Only photoprotons with energy from 4 to 8 Mev are considered in order to select those due mainly to the giant resonance in $O(\gamma,p)$ process. The angular distribution of the photoprotons is graphed. (M.H.R.)

9086

THE NUCLEAR PHOTOEFFECT IN LIGHT NUCLEI. F. C. Barker (Australian National Univ.). Phil. Mag. (8) 2, 780-4 (1957) June.

The energy of the giant resonance of the nuclear photoeffect is observed to be roughly independent of the mass number A for $A \lesssim 30$. It is shown that the results of energy calculations for light nuclei are consistent with the predictions of the nuclear shell model. (M.H.R.)

9087

NUCLEAR SPIN RELAXATION IN HYDROGEN. II. THE LIQUID. Meyer Bloom. Physica 23, 378-88(1957) May.

The proton spin relaxation time t_1 for H_2 liquid has been measured as a function of temperature and ortho-para concentration. For normal H_2, t_1 is found to be 0.18 second at 20.4°K and is found to increase with decreasing temperature and decrease with decreasing ortho-H_2 concentrations. Calculations show that the translational motion of the H_2 molecules contributes negligibly to t_1, and that the usual model used to explain the contribution to t_1 from reorienta-

tions of the molecules fails to explain the observed temperature and ortho-para concentrations dependences. The results are shown to be closely related to the behavior of t_1 in H_2 gas. Measurements on HD liquid show a t_1 of about 35 seconds. This is interpreted as being due to the translational motion of the molecules relative to one another, an argument being presented to show that the rotational contribution to t_1 is negligible for HD at the temperatures studied. (auth)

9088

THE EXCITATION OF THE DISCRETE LEVELS OF ATOMIC HYDROGEN BY FAST ELECTRONS. R. McCarroll (Queen's Univ. of Belfast). Proc. Phys. Soc. (London) A70, 460-5(1957) June.

The cross sections for the excitation of normal hydrogen atoms to the fifth and higher levels have been obtained by interpolation from the Born cross sections for the excitation to the second, third and fourth levels, and for ejection into the continuum. The cross section describing the excitation of all levels and the energy loss sustained by the incident electron are hence derived. (auth)

NUCLEAR REACTORS

9089 AERE-Inf/Bib-112

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

PHYSICS OF HETEROGENEOUS, LIGHT WATER MODERATED REACTORS. A BIBLIOGRAPHY OF PUBLISHED AND UNCLASSIFIED REPORT LITERATURE. A. Potter. Jan. 1957. 24p.

9090 ANL-5607

Argonne National Lab., Lemont, Ill.

THE EXPERIMENTAL BOILING WATER REACTOR (EBWR). May 1957. 236p. Contract [W-31-109-eng-38]. $2.25(GPO).

The final design of the EBWR is described in detail. The operational characteristics of the reactor and steam plant are given. Component descriptions are included for the reactor, the steam plant, the auxiliary systems, instrumentation, control systems, control arrangement, electrical generation and distribution system, and building and building services. (M.H.R.)

9091 ANL-5710

Argonne National Lab., Lemont, Ill.

THE THEORETICAL PHYSICS OF THE ARGONAUT REACTOR. Charles N. Kelber. May 1957. 50p. Cor tract W-31-109-eng-38. $0.35(OTS).

Three different methods of solving the two-group eq tions for the critical loading of Argonaut for as many different types of core configurations have been presented. The critical mass is overestimated for the lattices with highest critical mass and is underestimated in the case of lowest critical mass. In the cases of highest interest, the two-sided loading and the 3-inch annular loading, the mass prediction is very good indeed. In any case, the difference between experiment and theoretical prediction is not more than 400 gm. There is some question as to the proper value of the age; the value chosen for the 3-inch annular loading yields an estimate of the critical mass which is known to be too high. Use of the lowest estimation of the age yields the results summarized in the preceding paragraph. The annular array is the only one in which a reasonably good idealization of the physical set up can be made; since the calculation has been coded for a large computing machine (AVIDAC) it is anticipated that more precise calculations will allow a better empirical determination of the approximate age. (auth)

9092 BNL-3146

Brookhaven National Lab., Upton, N. Y.

SUMMARY HAZARDS REPORT ON ENRICHED FUEL ELEMENT LOADING FOR THE BNL RESEARCH REACTOR. N. Corngold. May 24, 1956. Decl. July 12, 1956. 47p. $0.55(OTS).

Discussions are included on the Brookhaven Pile and changes proposed, the nuclear physics of the enriched reactor, controls, kinetic behavior, temperature effects, fuel elements, hazards in normal operation and some credible accidents. (M.H.R.)

9093 BNL-3248

Sanderson and Porter, New York.

REACTOR HEAT REJECTION SYSTEM, LMFRE; BROOKHAVEN PRELIMINARY DESIGN. R. F. Benenati and R. P. Marche. July 24, 1956. 11p. [For Brookhaven National Lab. Contract AT-30-2-GEN-16]. $3.30(ph OTS); $2.40 (mf OTS).

In the preliminary design study of the LMFRE, the reactor heat output was assumed to be 5 Mw. It was proposed that this heat be dissipated to atmospheric air through an intermediate air loop. A study was undertaken to determine the effect on over-all cost of increasing the power level of the experiment and of varying the method of dissipating the reactor heat. Power levels considered were 10, 25, and 50 Mw. Eight heat dissipation methods were considered. Some of the obvious advantages and disadvantages of each system are discussed. (D.E.B.)

9094 CF-57-4-128

Oak Ridge National Lab., Tenn.

POSSIBILITY OF OXYGEN DEPLETION IN STAGNANT URANYL SULFATE LINES. E. Gift. Apr. 29, 1957. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

It is concluded that an excess of O_2 must be added to the HRT fuel circulating stream in amounts sufficient to recombine the D_2 in dead-end lines and serve as corrosion protection. (T.R.H.)

9095 CF-57-5-100

Oak Ridge National Lab., Tenn.

EFFECTS OF LETDOWN RATES AND OXYGEN INJECTION RATES ON XENON POISON LEVEL AND EXCESS OXYGEN CONCENTRATION IN THE HRT. P. N. Haubenreich. May 31, 1957. 34p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

Calculations indicate that it is impossible, even at high O_2 injection rates, to insure an excess of O_2 in the HRT fuel solution if the bubble letdown rate is more than 1 or 2 l/min. If, on the other hand, no bubbles are allowed to form, a reasonable excess O_2 concentration can be maintained with an O_2 injection rate which would not tax the capacity of the off-gas system. The Xe poison will be reduced to less than 2% by liquid letdown alone, and if an I_2 adsorption bed is installed below the catalytic recombiner, the Xe poison should be less than 1% without any bubble letdown. Therefore, it is recommended that sufficient Cu be added to prevent the formation of gas bubbles, and that the O_2 injection rate be limited to a value which would permit adequate holdup times in the present charcoal adsorption beds, assuming this quantity is sufficient to meet corrosion requirements. (auth)

9096 CF-57-6-5

Oak Ridge National Lab., Tenn.

CROSS SECTIONS FOR OCUSOL-A PROGRAM. J. T. Roberts and L. G. Alexander. June 11, 1957. 25p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A multi-group, multi-region reactor code method is used in order to get more information about intermediate reactors, especially those containing thorium. The cross sec-

tions now on the sigma-tape are tabulated. The bases for choosing these cross sections are explained. (M.H.R.)

9097 CF-57-6-17
Oak Ridge National Lab., Tenn.
OBSERVED PERFORMANCE OF THE FUEL SAMPLE COOLER. R. Van Winkle and R. R. Wiethaup. June 3, 1957. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Measurements of flow rate through the fuel high-pressure system sampler indicate that the average flow rate is about 0.29 gpm (145 lb/hr) plus or minus 50%, which affords an adequate purge of from 12 to 36 volumes through the sample line if the full fifteen minutes of purging is allowed before isolating the sample. The fuel sample cooler was found to have adequate capacity to reduce the temperature of the fuel solution from about 275 to 70°C, using pre-heated cooling water at 70°C. Uncertainties in temperature measurements make it impossible to estimate an observed over-all heat transfer coefficient. (auth)

9098 CF-57-6-26
Oak Ridge National Lab., Tenn.
SEPTEMBER 1956 MEASURE OF RADIATION LEVEL OF HRE FUEL SYSTEM COMPONENTS (AFTER STORAGE FOR 27 MONTHS). T. E. Haynes and R. Van Winkle. June 5, 1957. 4p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

Radiation level measurements of various HRE fuel system components, made in September, 1956, after 27 months of storage, are compared with the June, 1954, readings before storage. Measurements were made with a standard cutie pie and results tabulated. (M.H.R.)

9099 CF-57-6-36
Oak Ridge National Lab., Tenn.
CHEMICAL CLEANING AND STORAGE OF THE HRT STEAM AND CLOSED COOLING WATER SYSTEMS. H. A. McLain. June 5, 1957. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A 10% H_3PO_4 solution containing 0.2% "Rodine 45" inhibitor is recommended to be used for the chemical cleaning of the HRT steam and closed cooling water systems. Wet storage is recommended for both of these systems. The steam system is to be stored with steam condensate containing 100 ppm hydrazine, and closed cooling water system is to be stored with steam condensate containing 1000 ppm K_2CrO_4. (auth)

9100 CRNE-582
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
A STUDY OF SERVICEABILITY AND SAFETY IN THE CONTROL SYSTEM OF THE NRU REACTOR. E. Siddall. Nov. 9, 1954. 43p. (AECL-399).

Discussions are included on the present design, coincidence methods, and proposed changes. The instrumentation of the control system is discussed in some detail. (M.H.R.)

9101 HW-49567
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
CORE TEMPERATURES OF SWAGED UO_2 FUEL ELEMENTS. W. E. Roake. Apr. 5, 1957. 9p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The method for compaction of UO_2 powders by swaging in a restraining tube is described. The core temperatures to be expected are calculated. (T.R.H.)

9102 IDO-16316
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
SPERT-I INSTRUMENTATION. F. L. Bentzen. Mar. 15, 1957. 42p. Contract AT(10-1)-205. $0.30(OTS).

The SPERT-I reactor is used to investigate reactor behavior under simulated accident conditions. The primary data consist of measurements of fuel plate temperature, reactor power, and transient pressure as functions of time. Because of the nature of the tests all reactor operation and data recording are performed from a point 3000 ft from the test area. The various problems associated with inpile detectors, signal handling and operation are discussed. Instrumentation and circuitry for both the transient data system and reactor operation are presented. (auth)

9103 KAPL-M-EBF-7
Knolls Atomic Power Lab., Schenectady, N. Y.
AUTOMATIC NEUTRON FLUX PLOTTING. E. B. Fehr. Feb. 26, 1957. 24p. Contract W-31-109-Eng-52. $4.80 (ph OTS); $2.70(mf OTS).

The calculation of power distribution, flux gradients, and related parameters in the pressurized water type of reactor requires a very large number of neutron flux measurements in critical assemblies. An automatic counting system was designed to carry out these measurements efficiently and with a minimum of manpower and to furnish the results in a form suitable for automatic data processing. (auth)

9104 KAPL-M-RWD-18
Knolls Atomic Power Lab., Schenectady, N. Y.
PRELIMINARY NUCLEAR ANALYSIS OF STAINLESS STEEL WATER CORES. R. W. Deutsch and J. T. Daley, Jr. [Feb. 1957]. 9p. Contract W-31-109-Eng-52. $1.80 (ph OTS); $1.80(mf OTS).

A preliminary analysis comparing stainless steel-water cores to Zr-water cores has been completed using a three-group hand calculation technique. The fuel requirements for cores whose height and diameter are equal containing 30% stainless steel, 50% stainless steel and 50% Zr have been calculated for the hot depleted peak Xe condition. Possible difficulties expected to be encountered with stainless steal as compared to Zr are qualitatively discussed. (auth)

9105 KAPL-M-SWK-7
Knolls Atomic Power Lab., Schenectady, N. Y.
MEASUREMENT OF FUEL SELF-SHIELDING IN CLOSELY PACKED SLAB LATTICES. S. W. Kitchen. Mar. 15, 1957. 24p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

An accurate method for measuring the ratio of the gamma of homogeneous fuel to the grams per unit volume of closely-packed slab fuel which have the same reactivity effect, is described. Values for fuel one, two, three, and four mils thick are given for typical water-metal-fuel lattices. Comparison with one-velocity theoretical calculations indicates that the use of a one-velocity approximation and of an isotropic flux approximation are too crude to provide reliable estimates of this ratio in this spectrum for thin fuel slabs in closely packed lattices. (auth)

9106 LAMS-2126
Los Alamos Scientific Lab., N. Mex.
SUGGESTIONS ON THE DESIGN OF HETEROGENEOUS REACTORS. Bob W. Watt. Apr. 15, 1957. 5p. Contract W-7405-eng-36. $0.15(OTS).

Two suggestions for heterogeneous reactor design which would reduce the probability of a prompt critical assembly are made. It is proposed that while flowing out through the active material the coolant should flow as nearly normal to the constant flux density surfaces as practical. One type of accident could be prevented by spinning at least the active material fast enough to carry free active material to regions of lower flux. A possible reactor design is sketched. (M.H.R.)

9107 NAVORD-4470
Naval Ordnance Lab., White Oak, Md.
CALCULATION OF THE ENERGY ABSORPTION POTENTIAL FOR THE BLAST SHIELD OF THE ARGONNE NATIONAL LABORATORY NUCLEAR REACTOR, EBR-II. Walter R. Wise, Jr. Sept. 25, 1957. 22p.

The blast shield of the ANL reactor, EBR-II consists of cylindrical laminae of steel, celotex, and wood; the function of which is to absorb a portion of the energy which would be released by the reactor in the event of a nuclear excursion. General equations are derived for determining the energy absorption potential for the shield in terms of radial strain of the outermost steel cylinder. For the particular case where this strain is three inches, it is estimated that the energy absorbed by the blast shield would be equivalent to the detonation of about 1200 pounds of TNT. (auth)

9108 WAPD-167
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE EFFECTS OF IRRADIATION CYCLING ON PRESSURIZED WATER REACTOR BLANKET FUEL ELEMENTS. John D. Eichenberg. Mar. 13, 1957. 37p. Contract AT-11-1-GEN-14. $0.50(OTS).

Two PWR blanket fuel rods were irradiated in the L-42 cycling loop at the MTR at a maximum heat flux of 484,000 Btu/hr-ft^2. One of the rods had a 0.005-in. diam defect; the other rod was undefected. The rods were power cycled 533 times and achieved a maximum burnup of 1260 MWD/T. No changes in appearance or dimensions occurred as a result of the irradiation. No increase in the hydrogen content of the Zircaloy-2 cladding over that expected from the corrosion process was noted. Center melting occurred in the UO_2 from the defected specimen, whereas neither melting nor grain growth occurred in the UO_2 from the undefected specimen which was irradiated under essentially the same neutron flux. Two mechanisms are postulated which help to explain the observed phenomenon. The poorer thermal conductivity of the steam atmosphere in the defected rod as compared with the helium atmosphere in the undefected rod, coupled with the circumferential cracking in the defected rod, would explain a portion of the higher temperature. In addition, the formation of uranium oxide with an O/U ratio of 2.18 to 2.25 and with a possibly lower melting point is shown to be thermodynamically possible. This would also help explain the observed difference. However, the possibility of some unknown mechanism producing part of the observed difference in behavior cannot be discounted. (auth)

9109 WAPD-MRP-67
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
PRESSURIZED WATER REACTOR (PWR) PROJECT TECHNICAL PROGRESS REPORT FOR THE PERIOD FEBRUARY 24, 1957 TO APRIL 23, 1957. 76p. Contract AT-11-1-GEN-14. $0.45(OTS).

A protective coating known as "Liquid Tile" will be used to cover concrete surfaces of the fuel handling canal. A method was found for preventing excessive pressure build-up between the gates and in the bonnet of closed hydraulically operated valves. Facility construction status, plant systems installation, and component fabrication and testing are reviewed. Initial studies associated with core-2 design are discussed. Development and evaluation work is being conducted on fuel plate core and cladding dimensions, pickling effects on surface finish, integral fuel plate flange processing, and instrumented and source cluster fabrication. Satisfactory process control was established over subassembly welding. The statuses of in-pile experiments on radiation effects are presented. Thin UO_2 and UO_2–Al_2O_3 fuel plates being considered for core-2 were successfully fabricated by cold pressing and sintering. In-pile experiments to determine the effect of UO_2 density and heat flux on fission product release rates were completed. Further studies were made of ion exchange fission product removal from high pH water using LiOH resin. A pilot test showed excellent performance of the ion exchanger in removal of specific fission products. Studies were conducted to determine the corrosive effects of various decontamination agents on cooling system metals and alloys. Improved estimates of the cold, clean excess reactivity, the temperature coefficient, and the reactivity lifetime of core-1 were obtained. (For preceding period see WAPD-MRP-66.) (D.E.B.)

9110
THE BUILDING OF DOUNREAY. Atomics 8, 201-6(1957) June.

The construction of the Dounreay Fast Breeder Reactor is described. (W.L.H.)

9111
PRESSURISED WATER REACTORS FOR WORLD MARKETS. Atomics 8, 210-17(1957) June.

A detailed description of the engineering and operation of small "packaged" reactors with outputs ranging from 5 to 20 Mw of electricity is given. (W.L.H.)

9112
HOMOGENEOUS AQUEOUS REACTORS. R. Hurst, I Wells, and D. Newby (AERE, Harwell). Atomics 8, 218-19, 225 (1957) June.

The development, characteristics, and future prospects of homogeneous aqueous power reactors are discussed. (W.L.H.)

9113
ENGINEERING PROBLEMS OF NUCLEAR POWER. 2. Claude D. Gibb. Atomics 8, 226-30, 234(1957) June.

The problems encountered in the design and construction of reactor cores and their fuel elements are discussed. (W.L.H.)

9114
FIRST REPORT ON 1,500° F. AIRCRAFT EXPERIMENTAL NUCLEAR REACTOR. Alvin M. Weinberg (Oak Ridge National Lab., Tenn.). Chem. Eng. Progr. 53, No. 6, 6, 10 (1957) June.

Experiments at ORNL with the high-temperature, circulating-fluoride-fueled ARE are briefly described. The advantages of this reactor system which may make it useful as a power producer are outlined. (T.R.H.)

9115
HEAT TRANSFER ECONOMICS AS RELATED TO DESIGN OF NUCLEAR FUEL ELEMENTS. Donald Kallman (Babcock & Wilcox, New York). Chem. Eng. Progr. 53, 289-92 (1957) June.

A 250-mw pressurized-water reactor fuelled with stainless-steel clad UO_2 rods is considered from the standpoint of fuel fabrication expenses. (T.R.H.)

9116
EFFECTIVE CAPTURE CROSS-SECTIONS IN THE FAST REACTOR ZEPHYR. H. Rose (Atomic Energy Research Establishment, Harwell, England). J. Nuclear Energy 5, No. 1, 4-15(1957).

The simple perturbation technique has been used to determine effective capture cross sections for a large number of materials in the small experimental fast reactor ZEPHYR. Measurements have been made not only with the majority of the natural elements, but also with a considerable number of enriched isotopes. The results provide interesting information concerning the dependence of the fast-neutron capture cross sections upon nucleon number and shell structure. (auth)

9117

SYSTEMS OF HEAT REMOVAL FROM NUCLEAR REACTORS. V. S. Chirkin. J. Nuclear Energy 5, No. 1, 124-34(1957).

Different ways of using power plant and coolant to extract the heat evolved in a reactor core are described. A classification is given of heat extraction systems in which water, boiling water, aqueous solutions, gases, and liquid metals are used as coolant. (auth)

9118

METALLURGICAL ASPECTS OF CALDER HALL. Tom Bishop (John Miles & Partners., London). Metal Progress 71, No. 6, 65-71(1957) June.

Some of the metallurgical problems involved in the construction of the Calder Hall Reactors are discussed. Among these are U fabrication and canning, selection of steels for pressure vessels, and pressure vessel erection and stress relief. (W.L.H.)

9119

MOSCOW CLAIMS TO BE BUILDING AN ATOMIC PLANE. Missiles and Rockets 11, No. 6, 54(1957) June.

A brief discussion is presented by Professor G. Pokronsky the chief Soviet authority on atomic planes, on the Russian nuclear powered aircraft project. (W.L.H.)

9120

ATOMIC POWER PACKAGES FOR MISSILE LAUNCHING SITES. Missiles and Rockets 11, No. 6, 66-7(1957) June.

A discussion is given of the use of package power reactors similar to the armys' APPR-1, but less bulky, for power plants in missile launching sites. (W.L.H.)

9121

FUELS FOR THE ATOMIC ROCKET. Alfred J. Zaehringer. Missiles and Rockets 11, No. 6, 93-4(1957) June.

A brief account is given of the free world's reserves of U along with the amounts of U used for propulsion. The firms which are now doing research on atomic fuels are listed, along with their phase of work. (W.L.H.)

9122

NUCLEAR POWERED ROCKETS AND THE PROBLEMS OF HEAT RELEASE. Rudolf H. Reichel (Bell Aircraft Corp.). Missiles and Rockets 11, No. 6, 96-7(1957) June.

9123

ATOMIC POWER FOR AIRCRAFT AND MISSILES. A BIBLIOGRAPHY. Missiles and Rockets 11, No. 6, 136, 138, 140(1957) June.

9124

THE DOUNREAY FAST REACTOR. HERE IS HOW IT WORKS. Nuclear Power 2, 240-1(1957) June.

A 3 ft by 2 ft full color cutaway drawing of the Dounreay Fast Reactor is given. The fuel loading and power and fuel production are described. (M.H.R.)

9125

DFR TANK AND HEAT EXCHANGE SYSTEM MANUFACTURE AND INSTALLATION. Nuclear Power 2, 229-31 (1957) June.

The planning for access to parts, the tolerances in fabrication, the quality control, the intricacies of the welding, and other problems in the manufacture of the Dounreay Fast Reactor tank and heat exchange system are discussed. A large diagram of the system is included. (M.H.R.)

9126

DOUNREAY WORKS CHEMICAL AND METALLURGICAL PLANT. Nuclear Power 2, 232-4(1957) June.

Flow diagrams and description of the movement of reactor fuels through the chemical plant at Dounreay are given. (M.H.R.)

9127

THE DOUNREAY MATERIALS TESTING REACTOR. Nuclear Power 2, 235(1957) June.

A brief description of the Dounreay Materials Testing Reactor and its fuel elements is given. (M.H.R.)

9128

CIVIL ENGINEERING AT DOUNREAY. D. Cameron Lindsay (Whatlings Ltd.). Nuclear Power 2, 236-9(1957) June.

Discussions on civil engineering problems such as concreting in the sphere, sea water pumphouse, effluent tunnel, safety precautions, combating the weather, and concrete mixing are included. (M.H.R.)

9129

THE DOUNREAY FAST REACTOR. Nuclear Power 2, 224-8(1957) June.

Various phases of the operation of the Dounreay Fast Reactor are discussed. Among these are shutdown heat removal, fuel element discharging, and heat exchanger operation. (M.H.R.)

9130

ENRICHED vs. NATURAL U. John R. Menke (Nuclear Development Corp., White Plains, N. Y.), W. B. Lewis (Atomic Energy of Canada Ltd.), James A. Lane (Oak Ridge National Lab., Tenn.), Chauncey Starr (Atomics International, Canoga Park, Calif.) and William E. Shoupp (Westinghouse Electric Corp., Pittsburgh.). Nucleonics 15, No. 6, 68-71(1957) June.

A debate is presented of the merits of slightly enriched vs. natural-U reactors. (W.L.H.)

9131

PWR AND CALDER HALL. HOW DO THEY COMPARE? D. P. Herron and A. Puishes (American-Standard Atomic Energy Div., Redwood City, Calif.). Nucleonics 15, No. 6, 72-5(1957) June.

A comparison is presented of the PWR and Calder Hall Reactors as to which type of reactor has most promise for economic atomic power. The major technical, political and economic factors are considered. (W.L.H.)

9132

CHOOSING STORAGE TIME TO MINIMIZE PROCESSING COSTS. J. W. Ullmann and E. D. Arnold (Oak Ridge National Lab., Tenn.). Nucleonics 15, No. 6, 80-3(1957) June.

The cost of storing spent fuel is compared with processing, refabrication, and shielding costs to determine the optimum fuel cycle for hypothetical one-region and two-region reactors. Irradiation products, storage space required, decay time required, and thorium and U^{233} problems are considered. (T.R.H.)

9133

DEVELOPING ZIRCONIUM CANS FOR SRE MODERATOR GRAPHITE. James A. Leppard (Atomics International, Canoga Park, Calif.). Nucleonics 15, No. 6, 84-5(1957) June.

9134

RELIABLE REACTOR PROTECTION. E. Siddall (Atomic Energy of Canada Ltd., Chalk River, Ontario). Nucleonics 15, No. 6, 124-9(1957) June.

The possibility of developing reactor control systems which are adequately safe in themselves and do not rely on various features which reduce the seriousness of the consequences of control-system failure is discussed. The use of double instrument systems, or the redundancy principle, prevents unsafe conditions from going undetected due to instrument failure. The coincidence principle is possible with triple instrument systems where two instruments must agree before safety devices are tripped. Adding a built-in

testing system completes the reactor safety system proposed. (T.R.H.)

9135

CALCULATING BURNOUT EFFECTS. Arthur W. Banister and Raymond L. Murray (North Carolina State Coll., Raleigh). Nucleonics 15, No. 6, 129-33(1957) June.

A simple way to analyze the effect of fuel burnup and distributed poisons in a thermal reactor is given. The technique involves an interactive solution of the critical diffusion equation that describes the reactor after fuel burnup or fission product buildup has occurred. Perturbation terms are transposed to the right-hand side of the equation and with approximations the equation becomes inhomogeneous. Complementary and particular solutions which give the new flux distribution are found and, by applying boundary conditions, the perturbed critical condition is obtained. (T.R.H.)

9136

ATOMIC RESEARCH IN BELGIUM: SOME TECHNICAL ASPECTS OF THE BR-1 REACTOR AT MOL. Georges Stiennon. Industries Atomiques 6, 2-8(1957) May. (In French)

A description is given of the structure, control, and characteristics of the BR-1 reactor at Mol, Belgium. It is a natural U–graphite, air-cooled reactor with a maximum neutron flux exceeding 10^{12} neutrons/cm^2. The large volume of the reactor (6.66 × 6.84 × 6.84 m) permits numerous experimental facilities for simultaneous studies in many fields. (T.R.H.)

9137

THE COMPOUND NUCLEUS. F. Fridman and V. Vaiskopf. Uspekhi Fiz. Nauk 61, 399-422(1957) Mar. (In Russian)

A review is given of Bohr's original concept of the compound nucleus and nuclear reactions supplemented by up-to-date data which alter and expand the original idea. (R.V.J.)

NUCLEAR TRANSFORMATION

9138 UCRL-3749

California. Univ., Berkeley. Radiation Lab.

NEUTRON EMISSION FOLLOWING μ-MESON CAPTURE IN SILVER AND LEAD (thesis). Selig N. Kaplan. Apr. 10, 1957. 52p. Contract W-7405-eng-48. $9.30(ph OTS); $3.60(mf OTS).

The neutron yield from the capture of μ-mesons in Ag and Pb has been measured using a high-efficiency Cd-loaded liquid-scintillator tank. The average multiplicities were determined to be: $\bar{\nu}_{Ag} = 1.60 \pm 0.18$, and $\bar{\nu}_{Pb} = 1.64 \pm 0.16$. The multiplicity distributions were also measured and compared with several theoretical models. Although an α-particle model and a Fermi gas model with neutrons and protons having identical momentum distributions gave results not inconsistent with the data, a Fermi gas model with the effective nucleon mass M* set equal to M/2 seemed to provide the best fit. (auth)

9139

ON A REPORTED ISOMERIC STATE IN Mn^{54}. K. G. McNeill, J. D. Prentice, L. Katz, and W. Link (Univ. of Glasgow, Scotland and Univ. of Saskatchewan, Saskatoon). Can. J. Phys. 35, 753-6(1957) June.

An attempt was made to detect the 2-minute isomeric state in Mn^{54} reported by Caldwell and Stoddart [Phys. Rev. 81, 660A(1951)]. Irradiation of pure Mn^{55} with various energy bremsstrahlung of 12 to 24 Mev failed to disclose any (γ,n) reactions leading to this state. Iron targets irradiated by 13.5-Mev neutrons failed to disclose any positron activity of 2-minute half-life resulting from an (n,p) reaction to this state. In view of these experiments we conclude that the existence of the reported isomeric state in Mn^{54} should not be accepted without reservation. (auth)

9140

NUCLEAR REACTIONS INDUCED BY THE 14 MEV NEUTRONS. Shinjiro Yasumi (Kōnan Univ., Kōbe). J. Phys. Soc. Japan 12, 443-53(1957) May.

The nuclear reactions of Al, Fe, Cu, Zn, Mo and Ag produced by the neutrons from the $T^3(d, n)He^4$ reaction have been investigated by means of the activation technique. The absolute numbers of activated nuclei in samples were determined by measuring the beta-rays from the samples with a 4π proportional counter and applying the method of extrapolation. By utilizing the variations of neutron energies in the laboratory system, an excitation curve of $Mo^{92}(n, 2n)Mo^{91}$ reaction was obtained. For the cases of Al, Cl, Zn and Ag, only the gradients of excitation curves were also found. The experimental cross sections were determined as follows: 87.2 mb ± 8% for $Al^{27}(n, p)Mg^{27}$, 120 mb ± 12% for $Al^{27}(n, \alpha)Na^{24}$, 144 mb ± 13% for $Fe^{54}(n, p)Mn^{56}$, 556 mb ± 5% for $Cu^{63}(n, 2n)Cu^{62}$, 119 mb ± 12% for $Zn^{64}(n, 2n)Zn^{63}$, 60.2 mb ± 12% for $Zn^{66}(n, p)Cu^{66}$, 132 mb ± 16% for $Mo^{92}(n, 2n)Mo^{91}$, 458 mb ± 11% for $Ag^{107}(n, 2n)Ag^{106}$, and 604 mb ± 11% for $Ag^{109}(n, 2n)Ag^{108}$. Comparing these results with the predictions by the statistical theory of Weisskopf et al. it was found that they agreed with each other within about factor 3, but in details, there were some discrepancies between them. The relative behavior of excitation curve of the $Mo^{92}(n, 2n)Mo$ reaction seems to be consistent with the above theory, though with respect to the absolute values, the theoretical curve lies above the experimental one by about 2.4. (auth)

9141

A STUDY OF PROTONS EMITTED FROM ALUMINIUM, IRON AND RHODIUM ON BOMBARDMENT WITH NEUTRONS OF 13.2 MEV. G. Brown, G. C. Morrison, H. Muirhead, and W. T. Morton (Univ. of Glasgow). Phil Mag. (8) 2, 785-96(1957) June.

The angular distributions and energy spectra of the protons emitted, through the interaction of neutrons with an energy of 13.2 Mev with natural Al, Fe and Rh, have been studied using photographic emulsions. The experimental results have been compared with the predictions of a model which assumes that these protons can be emitted by two processes: by direct collisions of the incident neutron with a proton in the target nucleus and by the decay of a compound nucleus. Evidence for the process of direct interaction has been obtained in all cases. (auth)

9142

DIRECT EXCITATION IN THE PHOTODISINTEGRATION OF TANTALUM ABOVE THE GIANT RESONANCE. J. H. Carver, R. D. Edge, and K. H. Lokan (Australian National Univ., Canberra). Proc. Phys. Soc. (London) A70, 415-20 (1957) June.

The bremsstrahlung from the Canberra electron synchrotron has been used to measure the single and multiple photoneutron yields of Ta from the thresholds to 31 Mev. The ratio of the total integrated cross section for the (γ,n) reaction to that for the $(\gamma,2n) + (\gamma,3n)$ reactions is found to be $\int_0^{31}\sigma_1 dE/\int_0^{31}(\sigma_2 + \sigma_3)dE = 2.6 \pm 0.3$. For gamma rays of energy exceeding about 17 Mev significant contributions to σ_1 can only come from direct interactions, and the ratio of the integrated cross sections in this region is found to be $\int_{17}^{31}\sigma_1 dE/\int_{17}^{31}(\sigma_2 + \sigma_3)dE = 0.86 \pm 0.15$. The results show that direct interactions account for a large part of the photon absorption in the high-energy tail above the giant resonance. (auth)

9143

GAMMA RADIATION FOLLOWING PROTON CAPTURE IN

^{35}Cl, ^{37}Cl AND ^{39}K. II. ANGULAR DISTRIBUTIONS AND CORRELATIONS. R. Berenbaum and J. H. Matthews (Imperial Coll. of Science and Tech., London). Proc. Phys. Soc. (London) A70, 445-51(1957) June.

Angular distribution measurements and one angular correlation measurement have been made on a number of the γ rays observed in the reactions $Cl^{35}(p, \gamma)A^{36}$, $Cl^{37}(p, \gamma)A^{38}$ and $K^{39}(p, \gamma)Ca^{40}$ described in an earlier paper. From the results of these measurements the following probable assignments can be made to the levels in A^{36}, A^{38} and Ca^{40}: K^{39} + p 1120, 1300 and 1566 kev resonances, 1^+ (2^-); in Cl^{37} + p 1533 kev resonance, $2^{(-)}$; in Cl^{35} + p 1510 kev resonance, 1^+ (2^-); and 850 kev resonance, $3^{(+)}$. For the bound states observed in A^{36}: 1.95 Mev, $2^{(+)}$; 4.1 Mev, $3^{(-)}$. (auth)

9144

ON NON-CONSERVATION OF EVEN PARITY IN β DECAY. I. S. Shapiro. Uspekhi Fiz. Nauk 61, 313-30(1957) Mar. (In Russian)

Investigations of K meson and hyperon decay showed that their interaction constants coincide with the interaction constants in β decay. Attempts are made to analyze the nucleon β decay based on some similarities to the K meson and hyperon properties. The "τ-θ problem" and the decay, spin, and parity of τ and θ mesons are dealt with. The formal theory and experimental data are discussed. (R.V.J.)

PARTICLE ACCELERATORS

9145 MURA-273

Midwestern Universities Research Assn., Madison, Wis.

THE LINEAR EQUATIONS OF MOTION AND THE TUNE OF A FIXED-FIELD ACCELERATOR. G. Parzen. May 20, 1957. 28p. Contract AT(11-1)-384. $4.80(ph OTS); $2.70(mf OTS).

This paper is a continuation of the report MURA-258. A procedure for obtaining the linear equations for the oscillation of the particle about the equilibrium orbit in an accelerator having an arbitrary magnetic field, and for solving these linear equations for the tune and motion of the particle is given. Results of the procedure are given for the general radial sector (Mark I) and the general spiral sector (Mark V) machines. The results of the theory are compared with numerically computed results. (auth)

9146 NP-6326

Cornell Univ., Ithaca, N. Y. Floyd Newman Lab. of Nuclear Studies.

THE CORNELL BEV SYNCHROTRON. Robert R. Wilson. Dec. 1956. 86p. Contract Nonr-401(26).

The Cornell synchrotron was designed to accelerate electrons to 1.5 Bev, fit into an existing building, be constructable using a small machine shop, be relatively inexpensive, and use the power equipment of the existing accelerator. The design is summarized with discussions included on magnet construction, magnet excitation, correction coils, donut, injection, accelerating voltage, strong focusing lattice, timing, and circuits and wiring. (M.H.R.)

9147

THE EXTRACTION OF HIGH-ENERGY PARTICLE-BEAMS THROUGH THE YOKE OF THE SYNCHROCYCLOTRON ELECTROMAGNET. A. E. Ignatenko, V. V. Krivitsky, A. I. Mukhin, B. Pontecorvo, A. A. Ruet, and K. I. Tarakanov. J. Nuclear Energy 5, No. 1, 57-61(1957).

A method is described for obtaining collimated beams of high-energy particles, in particular π mesons, based on the use of the electromagnet yoke as the main shield from the direct radiation of the accelerator. By placing collimators in channels drilled in the electromagnet yoke, beams of π mesons with energies up to 400 Mev have been obtained. (auth)

9148

ALTERNATING-GRADIENT FOCUSING IN LINEAR ACCELERATORS. A. D. Vlasov. J. Nuclear Energy 5, No. 1, 62-70(1957).

A linear theory of alternating-gradient or strong focusing in linear ion accelerators is presented. (auth)

9149

ELECTRON MODEL FIXED FIELD ALTERNATING GRADIENT ACCELERATOR. F. T. Cole, R. O. Haxby, L. W. Jones, C. H. Pruett, and K. M. Terwilliger (Midwestern Universities Research Association, Madison, Wisc.). Rev. Sci. Instr. 28, 403-20(1957) June.

A radial sector FFAG accelerator has been constructed and successfully operated. In this 8-sector accelerator electrons are betatron accelerated from 25 to 400 kev using both continuous and pulsed injection. The number of radial betatron oscillations per revolution may be varied from 2.3 to 3 and the number of vertical oscillations per revolution from 1 to 3. Calculations of these oscillation frequencies using various approximations are described and discussed. These frequencies have been measured statically with the unaccelerated beam and dynamically using an r-f perturbing voltage on the accelerated beam. Results of these calculations and experiments are in satisfactory agreement. Effects of misalignments have been measured and are in close agreement with calculations presented. A survey has been made over a large area of the betatron oscillation stability region. The effects of the many resonances observed are in good qualitative agreement with theory. (auth)

RADIATION ABSORPTION AND SCATTERING

9150

RESONANCE ABSORPTION OF NEUTRONS BY THORIUM CYLINDERS. Monte V. Davis (General Electric Co., Richland, Wash.). J. Appl. Phys. 28, 714-16(1957) June.

The integrated effective resonance neutron absorption cross section of Th^{232} cylinders has been experimentally investigated by danger coefficient measurements in the Hanford Test Pile. The results were interpreted to yield the effective resonance integral as a function of the surface-to-mass ratio of the thorium cylinders. The experiments were extended to determine the Doppler coefficients resulting from heating the thorium in a constant neutron energy spectrum in the reactor. After correction for $1/v$ neutron absorption, the effective resonance integral can be approximated as a function of the surface-to-mass ratio by the equation given. The value assigned to the Doppler coefficient of the volume absorption of the effective resonance integral is given. The results are compared to similar measurements on uranium. (auth)

9151

PHASE SHIFT ANALYSIS OF PROTON-PROTON SCATTERING EXPERIMENTS. II. ANALYSIS OF THE SCATTERING DATA FROM 18 TO 260 Mev. E. Clementel, C. Villi, and L. Jess. Nuovo cimento (10) 5, 907-20(1957)

The experimental data on p-p scattering in the energy interval 18 to 260 Mev are discussed by using an analytical method and limiting the analysis to the contribution of the S and P states. The polarization data at high energy allow a double set of phase shifts which reproduce the angular distributions in the considered energy interval. The two sets follow from the behavior of the singlet S phase shift, which can either become negative at about 220 Mev or be simply a decreasing function of the energy without assuming negative values. The stability of the solutions thus found against the introduction of the $^1D_2$ and $^3F_2$ states is also discussed. Finally, the present results are compared

with the solutions already obtained in p-p scattering analysis by different authors. (auth)

9152

ON THE SCATTERING OF PARTICLES BY A FORCE CENTRE ACCORDING TO THE RADIATION DAMPING THEORY. A. Sokolov and B. Kerimov (State Univ., Moscow). Nuovo cimento (10) 5, 921-39(1957) Apr.

The elastic scattering of particles by a force center at rest is investigated with the help of the radiation damping theory. Formulas are obtained both for the effective cross-sections and for the phase shifts of the scattering by the short-range force center. In conclusion a comparison is given of the formulas obtained by different methods. (auth)

9153

INTERFERENCE IN THE DOUBLE COMPTON EFFECT. B. De Tollis and R. S. Liotta. Nuovo cimento (10) 5, 947-54(1957) Apr.

The differential cross section by double Compton effect is calculated in the case of identity of the two emitted photons. It results a factor of interference $1/(4\pi)^2$ besides the factor 1/137 due to the perturbative development. (auth)

9154

MACHINE ANALYSIS OF PION SCATTERING BY THE MAXIMUM LIKELIHOOD METHOD. H. L. Anderson and W. C. Davidon (Univ. of Chicago, Ill.). Nuovo cimento (10) 5, 1238-55(1957) May.

The method used to carry out a phase shift analysis of the pion-proton scattering events found in photographic emulsions and in the hydrogen diffusion cloud chamber is reported. The method uses an electronic computer to find the best set of phase shifts for a set of scattering events having a given energy, according to a maximum likelihood criterium. This problem was coded for the electronic computer, Avidac, of the Argonne National Laboratory, and used to analyze the events found by various groups of experimenters. Most of the results have already been reported. The analyses were carried out for positive pions scattered by protons and could include d-waves as well as s- and p-waves, together with the effect of the Coulomb interaction. (auth)

9155

ON THE PHASE-SHIFT ANALYSIS OF HIGH-ENERGY p-p SCATTERING. R. J. N. Phillips (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuovo cimento (10) 5, 1335-7(1957) May.

In the region of 140 Mev, where p-p polarization reveals large F-wave effects, it is hoped that S, P, D, and F waves will be sufficient to describe the scattering. However, single- and double-scattering experiments do not yield enough information for a full analysis in terms of all eight phase shifts, together with the $^3P_2-^3F_2$ coupling parameter. Since the data are inadequate, assumptions are made and some phase shift fits are offered to show the large effect of particular assumptions about the form of the ^3F interaction on the form of solution that can be found. It is concluded that there is clearly a need for triple-scattering and/or correlation experiments to be performed in this energy region, in spite of experimental difficulties, so that a reliable analysis of the nucleon-nucleon interaction may be made. (M.H.R.)

RADIATION EFFECTS

9156 KAPL-1742

Knolls Atomic Power Lab., Schenectady, N. Y.

SUMMARY OF FAST NEUTRON IRRADIATION STUDIES ON GERMANIUM. W. A. Smith, Jr., J. E. Noonan, and K. Minassian. Apr. 26, 1957. 35p. Contract W-31-109-Eng-52. $0.30(OTS).

A summary is given of studies made at KAPL to determine the energy dependence of fast neutron effects on the electrical properties of Ge. Irradiations were made by using neutrons produced in positive ion reactions. A non-linear relationship between neutron energy and the number of interstitial atoms produced per neutron is indicated for the energy range 0.7 to 4.8 Mev. Material preparation techniques are discussed and methods of determining neutron response characteristics of Ge materials for dosimetry applications are presented. (auth)

9157 NARF-57-17T

Convair, Fort Worth, Tex.

SEPARATION OF NUCLEAR EFFECTS IN A MIXED RADIATION FIELD. AN EXPERIMENTAL DESIGN FOR MATERIALS AND COMPONENT DAMAGE STUDIES. D. W. Gaylor and J. B. Wattier. Feb. 2, 1957. 33p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-153).

An experimental design is presented for separating the effects of fast neutron dose rate, gamma dose rate, integrated fast neutron dose, and integrated gamma dose on materials and electronic components exposed to mixed radiation fields. The experimental design consists of two parts: an exploratory experiment and a descriptive experiment. The purpose of the exploratory experiment is to determine which of the four radiation factors are significant for each material and component investigated. The purpose of the descriptive experiment is to determine the functional relationship between damage and these significant factors. This sequential procedure reduces the number of irradiations that would otherwise be required by about half. The procedures given can be extended to study the interactions of a nuclear environment with non-nuclear environments such as temperature, vibration, and pressure. The validity of the results depends upon the ability to measure dose rate or integrated dose on a relative scale and upon the validity of the assumption that the change in the functional response of a material or component is negligible for small spectrum changes. (auth)

9158

LOW-TEMPERATURE REACTOR IRRADIATION EFFECTS IN METALS. T. H. Blewitt, R. R. Coltman, C. E. Klabunde, and T. S. Noggle (Oak Ridge National Lab., Tenn.). J. Appl. Phys. 28, 639-44(1957) June.

The effects of structural and chemical defects on the low-temperature annealing peak in low-temperature reactor-irradiated Al and Cu were studied. From the fact that the density of reactor-induced defects did not affect the annealing kinetics, it was possible to conclude that the low-temperature annealing process was of the first order without a unique activation energy. The fact that both oversized and undersized atoms could suppress this annealing peak led to the conclusion that the radiation-induced defects were more complicated than simple point defects. The suggestion is made that a defect similar to a crowdion must be created by low-temperature neutron irradiation. These data also support to some degree the viewpoint that a radiation-induced defect, possibly a crowdion, has sufficient knock-on energy to migrate several hundred atomic distances. The experiments also contain evidence which rule out all forms of vacancy-interstitial annihilation. (auth)

9159

LOW-TEMPERATURE MEASUREMENTS OF THE YOUNG'S MODULUS AND INTERNAL FRICTION OF COPPER DURING IRRADIATION. D. O. Thompson, T. H. Blewitt, and D. K. Holmes (Oak Ridge National Lab., Tenn.). J. Appl. Phys. 28, 742-3(1957) June.

Measurements of the Young's modulus and internal friction of a copper single crystal have been made during irradiation at about 21°K in the Hole 12 cryostat in the ORNL

Graphite Reactor with a fast neutron flux of about 7×10^{11} n/cm^2 sec. Results are graphed. (M.H.R.)

9160

ON THE ATOMIC DISPLACEMENTS PRODUCED BY α-PARTICLES IN GERMANIUM. A. Ascoli, M. Asdente, and E. Germagnoli (Lab. CISE, Milano). Nuovo cimento (10) 5, 1145-52(1957) May.

The number of negative carriers which are removed from the conduction band by irradiation of germanium single crystals with P^{210} α particles is measured from the initial rate of decrease of conductivity in n-type germanium. It has been found that (79 ± 5) electrons are removed by a 5.30 Mev α particle. The possibility of comparing this result with the theory of atomic displacements by high energy charged particles is discussed. (auth)

RADIOACTIVITY

9161 NP-6325

Tulane Univ., New Orleans.

STUDY OF NUCLEAR DISINTEGRATIONS. Final Report. [for] July 1, 1953 to May 31, 1957. Charles L. Peacock. 63p. DA Project No. 5-B-99-01-004. Contracts DA-01-009-ORD-344 and DA-01-009-ORD-458.

The results of studies on the following radioisotopes: Ag^{110}, Sb^{124}, Cs^{134}, Br^{82}, Ba^{140}, and Sc^{46} are given. The beta spectra and gamma rays of each isotope were studied. (M.H.R.)

9162

LEVEL SCHEME OF Re^{185}. Nadine Marty and Michel Vergnes. J. phys. radium 18, 233-8(1957) Apr. (In French)

The disintegration of Os^{185} was studied using a Slätis–Siegbahn β spectrograph, and a γ scintillation spectrometer, for coincidences between two scintillation spectrometers, as well as for a set-up for "slow-fast" coincidences with energy selection for the investigation of short periods of the order of 10^{-9} seconds. (tr-auth)

9163

RESOLVING COMPLEX DECAY CURVES. D. H. Perkel (Tracerlab, Inc., Richmond, Calif.). Nucleonics 15, No. 6, 103-6(1957) June.

An analytical method is described for resolving complex decay curves, which can be applied to a limited decay curve. It is shown how this linear method can be applied to 3-component decays and can detect and measure contamination in a 2-component sample. The method is limited to cases where decay constants are known accurately and the contribution of a fourth activity can be assumed negligible. (T.R.H.)

9164

A GENERALIZATION OF THE MARSDEN-BARRATT LAW FOR TIME-CORRELATED RADIOACTIVE DECAY. H. Lindeman and N. Rosen (Israel Inst. of Tech., Haifa). Physica 23, 436-40(1957) May.

A derivation is given of a probability law, which replaces the Marsden-Barratt law for the probability of a given time interval between two successive disintegrations in certain cases of time-correlated radioactive decay. (auth)

9165

GAMMA-GAMMA ANGULAR CORRELATION IN THE DECAY OF ^{203}Pb. B. van Nooijen and A. H. Wapstra. Physica 23, 404-6(1957) May.

The electron-capture decay of Pb^{203} is followed by a cascade of two gamma rays of 404 and 279 kev, and by a cross-over gamma ray of 683 kev. The angular correlation values, previously obtained, for the first two gamma rays were checked. The data taken together indicate that the anisotropy does depend on the physical state of the source, due to extranuclear fields. A comparison of various values for conversion coefficients for the 404-kev transition in Tl^{203} is given. (M.H.R.)

9166

SEARCH FOR A RARE α-EMISSION IN ^{228}Ra (MaTh 1). N. Feather, N. Miller, and S. W. Peat (Edinburgh Univ.) Proc. Phys. Soc. (London) A70, 478-80(1957) June.

The search for a branching in the thorium series at Ra^{228} by α decay to Em^{224} was carried out by attempting to detect Ra^{224}, the point of return to the main chain. After many chemical procedures, a solution of the residue was used to impregnate a nuclear emulsion in order to detect the decay of Ra^{224} by means of its star of three or more α tracks. Results were inconclusive as such stars were not found in significantly greater numbers than background. (M.H.R.)

9167

THE PRODUCTION OF In^{113m} FROM NEUTRON-BOMBARDED TIN. V. D. Nefedov, G. P. Lepnev, E. N. Sinotova, and M. A. Toropova (Zhdanov State Univ.). Zhur. Fiz. Khim. 31, 354-61(1957) Feb. (In Russian)

It has been shown that a long life carrier-less source of In^{113m} can be produced, using the metallo-organic compounds $Sn(C_6H_5)_4$ and $Sn(C_6H_5)_3Cl$ as parent substances. A method has been developed for production of very pure preparations of In^{113m} in quantitative yield. (tr-auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

9168

LANTHANUM SULFIDES. N. P. Zvereva. Doklady Akad. Nauk S.S.S.R. 113, 333-4(1957) Mar. 11. (In Russian)

Monocrystals of LaS prepared from lanthanum nitrates and metallic lanthanum had two microstructure phases, a large oval yellow grain of LaS with a light gray border phase of lanthanum oxysulfide. The composition of the monosulfide was 95 to 97% LaS and ~3 to 5% oxysulfide; the microhardness with 20g load was 197 ± 1.5 kg/mm^2. Specimens of LaS heated in vacuum up to 2100° did not melt. (R.V.J.)

9169

THE ISOTOPIC COMPOSITION OF RARE-EARTH ELEMENTS FORMED BY FISSION OF URANIUM, THORIUM, AND BISMUTH WITH 680-MeV PROTONS. F. I. Pavlotskaya and A. K. Lavrukhina. J. Nuclear Energy 5, No. 1, 149-57(1957).

Results are given of a radiochemical investigation of the rare earths formed by fission of U, Th, and Bi nuclei with 680-Mev protons. In this work, which was carried out in 1954, special attention was given to methods of separation of these elements. The influence of various factors on the degree of separation was studied to find the optimum conditions for an ion-exchange chromatographic separation method. These factors were the nature of complexing agents (ammonium acetate, citrate, oxalate, and lactate), the pH of the eluant and the concentration of rare earths. A decay-curve method allowed us to detect radioisotopes of almost all the rare earths and to determine yields of some of them. The formation of a new isotope of Sm with half life approximately 20 days is also proposed. (auth)

9170

THE SPECIFIC HEATS AND MAGNETIC SUSCEPTIBILITIES OF ALLOYS OF CERIUM WITH LANTHANUM AT LOW TEMPERATURES. Lois M. Roberts and J. M. Lock (Royal Radar Establishment, Gt. Malvern, Worcs.). Phil. Mag. (8) 2, 811-19(1957) June.

Specific heat measurements between 1.5 and 20°K, and magnetic susceptibility measurements between 1.5 and

290°K have been made on four alloys containing respectively 78.9%, 37.6%, 27.0% and 5.03% by weight of Ce in La. Comparison is made with similar previous measurements on pure Ce. The single anomaly in the specific heat of pure Ce at 12.3°K splits into two in the alloys, and as the dilution is increased these anomalies move to lower temperatures. The lower of the two only is accompanied by a change in the magnetic properties, a maximum occurring in the susceptibility of the most concentrated alloy and temperature-independent paramagnetism setting in suddenly in the next two. In the most dilute alloy the anomalies in both the specific heat and in the susceptibility appear to have moved to temperatures below 1.5°K. Above 80°K the magnetic susceptibilities of all the alloys obeyed a Curie–Weiss law, $x = C/(T-\theta)$. The Curie constant C varied smoothly from 56.1×10^{-4} e.m.u./g Ce for the most concentrated alloy (cf. 55.3×10^{-4} e.m.u./g for pure Ce) to about 140×10^{-4} e.m.u./g Ce for the most dilute alloy. As in pure Ce, antiferromagnetism is believed to be the explanation of the anomalous magnetic behavior of the alloys. However, the double specific heat anomalies in the latter suggest that the ordering of the 4f electronic orbitals takes place in two stages, while the temperature-independent paramagnetism of the more dilute alloys may be the consequence of freedom of the direction of magnetic ordering to orient itself perpendicular to the applied field. The increase in the Curie constant suggests that the population of the 4f shell increases, with dilution of the alloys, to 2 or 3 electrons per atom of Ce. (auth)

9171

THE MAGNETIC SUSCEPTIBILITIES OF LANTHANUM, CERIUM, PRASEODYMIUM, NEODYMIUM AND SAMARIUM, FROM 1.5 TO 300°K. J. M. Lock (Royal Radar Establishment, Great Malvern, Worcs.). Proc. Phys. Soc. (London) B70, 566-76(1957) June.

The magnetic susceptibilities of the rare-earth metals lanthanum, cerium, praseodymium, neodymium and samarium have been measured over the temperature range 1.5 to 300°K. Low temperature anomalies correlating with recent specific heat measurements have been found in cerium, neodymium and samarium at temperatures of 12.5, 7.5 and 14.8°K respectively, and it is believed that these metals become anti-ferromagnetic below these temperatures. At higher temperatures the susceptibilities of cerium and praseodymium obey the Curie-Weiss law, with effective atomic moments of 2.51 and 3.56 Bohr magnetons respectively. Neodymium obeys a law of the form $\chi = C/(T-\theta) + K$, where the Curie constant C indicates an effective atomic moment of 3.3 Bohr magnetons (μ_B). These moments are in fair agreement with the values expected for the trivalent ions of the elements, assuming Russell–Saunders coupling of the orbital and spin moments of the 4f electrons. (auth)

SHIELDING

9172 AECU-3464

Sandia Corp., Albuquerque. N. Mex.

A PROBLEM IN REACTOR SHIELDING. D. C. Kleinecke. Dec. 18, 1956. 17p. Contract [AT(29-1)-789]. (TM-288-56-51).

The problem of heating in the concrete shielding walls surrounding a reactor is treated. Heating in the walls is determined from the partial differential equation of heat flow with sources for three very simple models. The heating in the exact configuration should not differ greatly from that observed in the models. (auth)

9173

THE SHIELDING PROPERTIES OF CONCRETE. V. S. Dikarev, M. B. Egiazarov, E. N. Korolev, and V. G. Madyeev. J. Nuclear Energy 5, No. 1, 166-8(1957).

It is shown that for the given neutron and γ-ray spectra, limonite concrete has better shielding properties than ordinary concrete. Detailed results are tabulated and apparatus described. (M.H.R.)

SPECTROSCOPY

9174

HIGH RESOLUTION RAMAN SPECTROSCOPY OF GASES. IX. SPECTRA OF H_2, HD, AND D_2. B. P. Stoicheff (National Research Council, Ottawa). Can. J. Phys. 35, 730-41 (1957) June.

The pure rotational lines and the Q branch lines of the 1–0 vibrational bands of H_2, HD, and D_2 have been photographed with a 21 ft grating spectrograph. From these spectra, a complete set of constants for the v = 0 and 1 levels of all three molecules have been determined. When these constants are combined with Herzberg's results of the forbidden infrared spectra of H_2 and HD they lead to improved values of the electronic ground state constants of H_2 and HD. The leading terms in the Dunham power series expansion of the potential are calculated for H_2 and HD and are found to be mutually consistent. The isotopic relations are obeyed within experimental accuracy, and the small constants D_e, B_e, and H_e are in agreement with values given by theoretical formula. (auth)

9175

ON THE IDENTITY OF COHERENCE TIME MEASURED BY MAGNETIC RESONANCE AND MAGNETIC DEPOLARIZATION IN Hg^{202}. Jean-Pierre Barrat. Compt. rend. 244, 2785-8(1957) June 3. (In French)

9176

THE L-SERIES EMISSION SPECTRUM OF KRYPTON. H. R. Moore (Dominion Physical Lab., New Zealand). Proc. Phys. Soc. (London) A70, 466-73(1957) June.

The L spectrum of krypton has been observed in emission from an electrodeless discharge source and recorded photographically with a bent crystal spectrometer. Wavelength values are given for seven diagram lines ($L\beta_1$: 7547 X.U.; $L\alpha_{1,2}$: 7788 X.U.), one quadrupole line and ten satellite lines. The half widths and intensities of the latter are compared with those of their parent lines $L\beta_1$ and $L\alpha_{1,2}$. The x-ray energy levels L_I(1920 ev), $M_{IV,V}$(87 ev) and N_I(20 ev) are evaluated. A quasi-optical origin for some extra lines observed in this spectrum is proposed. (auth)

THEORETICAL PHYSICS

9177

ON SOLVING THE TRANSFER EQUATION FOR STRONGLY ANISOTROPIC SCATTERING. T. A. Germogenova (Steklov Mathematical Inst., Acad. of Sciences U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 113, 297-300(1957) Mar. 11. (In Russian)

9178

ON CALCULATING TIME CORRELATION FUNCTIONS FOR STATISTICAL SYSTEMS CONSISTING OF LONG-RANGE INTERACTING PARTICLES FOR ANY TIME UP TO THE MEAN FREE PATH TIME. V. V. Tolmachev. Doklady Akad. Nauk S.S.S.R. 113, 301-4(1957) Mar. 11. (In Russian)

9179

THE STATISTICAL MECHANICS OF THE STEADY STATE. H. N. V. Temperley (Atomic Weapons Research Establish-

ment, Aldermaston, Berks). Proc. Phys. Soc. (London) B70, 577-89(1957) June.

It is shown that the Fowler-Darwin definitions of the temperature and chemical potential can be extended in a natural way to cover non-equilibrium but steady assemblies. The concept of equilibrium is replaced by the more general one of compatibility, and it becomes possible to show that the proposed statistical definitions of quantities like temperature reduce to suitable averages over the assembly of the locally measured quantities. The usual restrictions to small departures from equilibrium are unnecessary. A simple problem (flow of gas in a tube) is discussed from the new point of view. (auth)

9180

POLARIZATION OF SPIN ONE PARTICLES AFTER AN ELASTIC SCATTERING BY SPIN ZERO NUCLEI AT LOW ENERGY. Shigueo Watanabe. Rev. mex. fis. 6, 59-71 (1957) Apr. (In Spanish)

The polarization of a beam of spin one particles after an elastic scattering by spin zero nuclei at low energy was studied. The transition matrix $M(\theta,E)$ is determined using Lepore's method, assuming the spin-orbit term in the Hamiltonian, but not the tensor force since the nuclei have spin zero. The result is that, if the incident beam is polarized the differential cross section of the elastic scattering is a sum of three terms. The first is independent of the incident and outgoing beams; the second term is a scalar product of the polarization vectors of the incident and outgoing beams, and third one is the scalar product of the tensors of polarization of the two beams. This result suggests two types of double scattering. One is to be carried out in the same scattering plane, and the other in two orthogonal planes i.e. the differential cross section of the second scattering must be measured in the plane perpendicular to the first scattering plane. In the former double scattering we find an azimuthal asymmetry, whereas in the latter one, none. If we assume that the spin one nuclei, namely the deuteron, Li_6, and N_{14} behave as a whole, i.e. that each component of the nuclei do not interact directly with the scatterer, then the treatment developed here must be applicable to the elastic scattering of the spin one nuclei by spin zero nuclei. (auth)

TRACER APPLICATIONS

9181

C^{14} TRACER MEASURES FUEL DISTRIBUTION. Douglas E. Cooper (Ethyl Corporation Research Labs., Ferndale, Mich.). Nucleonics 15, No. 6, 136-40(1957) June.

The technique for radio tracer study of the distribution of gasoline additives (tetraethyl lead, tricresyl phosphate, etc.) in internal combustion engine intake systems is described. (T.R.H.)

URANIUM AND URANIUM COMPOUNDS

9182 IGRL-T/C-32

PREPARATION OF LARGE CRYSTALS OF α-URANIUM. Translated by D. Hardie from Commissariat à l'Energie Atomique. Technologie. Métallographie. Compte Rendu d'Esseis, C-57, 1955. 18p.

The production of true single crystals of U by the controlled phase change method does not appear possible. It is only possible in this manner to obtain either single grains of fairly large dimensions (0.8 × 5 × 60 mm) but with a strong sub-structure, the disorientations between cells varying from 1 to 10° although the orientation remains constant along the specimen, or alternatively grains of 4 to 5 mm with a distinctly better structure (disorientation 1 to 2°). Critical cold working enables grains with highly perfected structure to be obtained, although these grains may be of somewhat smaller size (2 mm) and always more or less deformed. The defects observed in the crystals seem to to arise only from deformations at high temperatures in the α-phase and, every time the stresses were reduced the structure was improved. (auth)

9183

THE VARIATION OF α OF $_{92}U^{235}$ WITH ENERGY IN THE INTERMEDIATE-ENERGY RANGE. Sophie Oleksa (Brookhaven National Lab., Upton, N. Y.). J. Nuclear Energy 5, No. 1, 16-32(1957).

Recent experiments have made possible a new evaluation of resonance parameters for some of the low-energy levels of $_{92}U^{235}$. The data permit a numerical calculation of the variation of α of $_{92}U^{235}$ with energy in the range 100 to 10,000 ev in accordance with a method proposed by Wigner. The effects of fitting the experimental data with several different distributions were examined. The results are: The variation of α (U^{235}) with energy from 100 to 10,000 ev is a slow one, no matter which of several distributions is assumed to hold for the fission and neutron widths. The values of α obtained by means of Wigner's theory are in good agreement with results of the KAPL integral experiments. The calculated values of $\bar{\sigma}(n,f)$ agree reasonably well with the experimental values. The theory can be applied with confidence to fissionable materials other than U^{235} for which comparable information about low-energy resonances is available. (auth)

9184

THE ACTIVATION CROSS-SECTION OF U^{238}. B. V. Efimov and Y. I. Mityaev. J. Nuclear Energy 5, No. 1, 158-9(1957).

The value of 24.6 ± 6b was found for the radiative capture cross section of U^{238}. (M.H.R.)

9185

CRITICAL MASSES OF ORALLOY ASSEMBLIES. Glen A. Graves and H. C. Paxton (Los Alamos Scientific Lab., N. Mex.). Nucleonics 15, No. 6, 90-2(1957) June.

A summary of empirical data on critical configurations of fissionable metals is presented in a form that emphasizes the influence of conditions commonly of concern in nuclear safety questions. (T.R.H.)

Refer also to abstract 8915.